RBR 1703

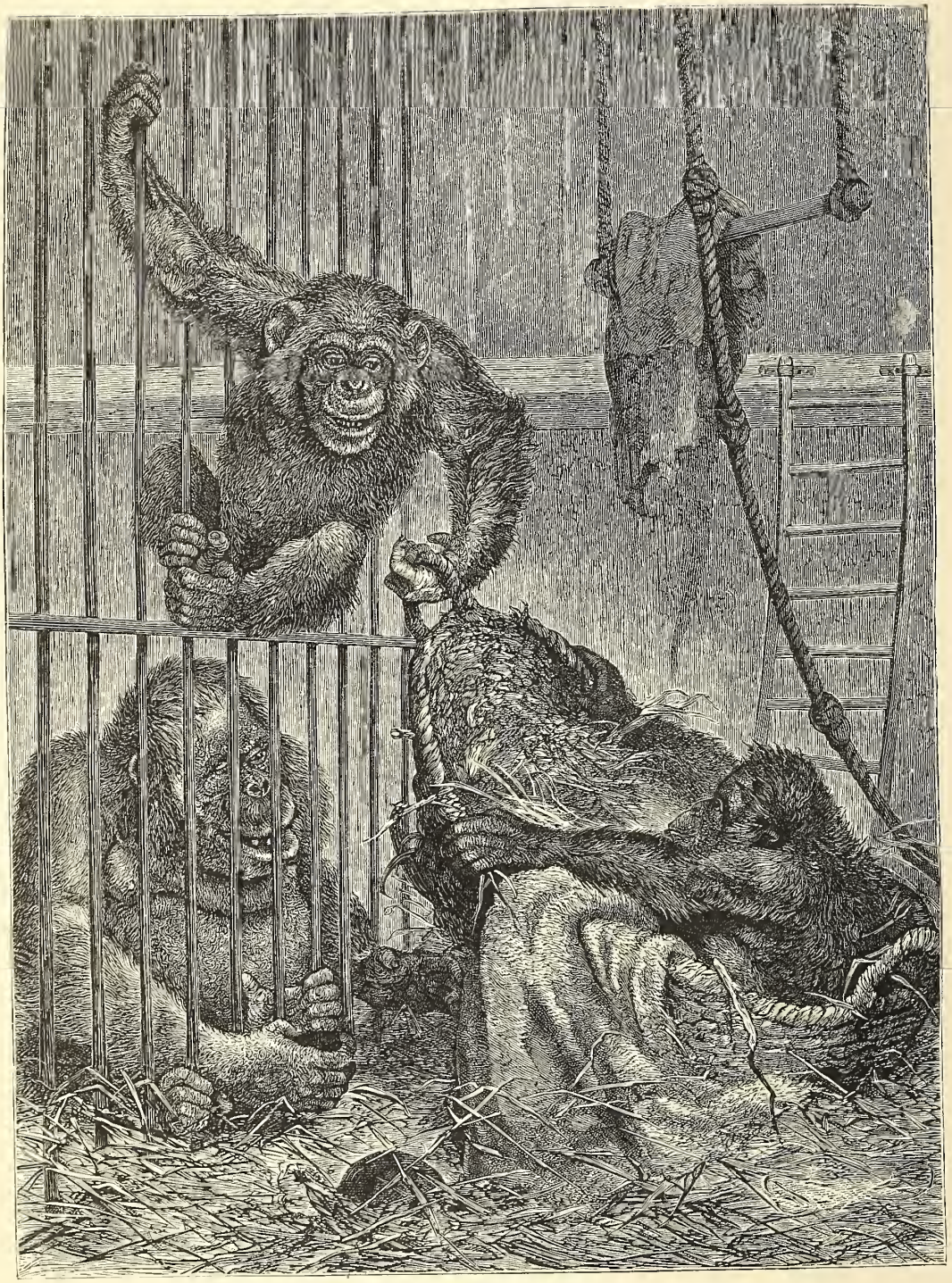
Library

of the

University of Toronto

Digitized by the Internet Archive
in 2017 with funding from
University of Toronto

https://archive.org/details/cassellsnaturalh01dunc_0



ORANG-UTAN AND CHIMPANZEES IN THE BERLIN AQUARIUM.

(From an Original Drawing.)

CASSELL'S

NATURAL HISTORY.

EDITED BY

P. MARTIN DUNCAN, M.B. (LOND.), F.R.S., F.G.S.,

PROFESSOR OF GEOLOGY IN, AND HONORARY FELLOW OF, KING'S COLLEGE, LONDON.

VOL. I.

ILLUSTRATED.

CASSELL PETTER & GALPIN:

LONDON, PARIS & NEW YORK.

[ALL RIGHTS RESERVED.]

APES AND MONKEYS.

PROFESSOR P. MARTIN DUNCAN, M.B. (Lond.), F.R.S., F.G.S., &c.

LEMURS.

J. MURIE, M.D., LL.D., F.L.S., F.G.S., &c.

AND

PROFESSOR P. MARTIN DUNCAN.

CHIROPTERA.

W. S. DALLAS, F.L.S.

INSECTIVORA.

W. S. DALLAS, F.L.S.

CONTENTS.

PAGE

INTRODUCTION i

QUADRUMANA.—THE APES AND MONKEYS.

CHAPTER I.

INTRODUCTION—THE MAN-SHAPED APES—THE GORILLA.

The World of Monkeys, and its Division into great Groups—Distinction between the Old World and New World Monkeys—Classification of Monkeys—THE GORILLA, Ancient and Modern Stories about it—Investigations of Savage and Du Chaillu—General Description—The Head, Brain, Teeth, Taste, Smell, and Voice—The Air Sacs, and Ear—The Limbs and Muscles—Method of Climbing—Diet—Hunting the Gorilla—Attempts to Capture Alive—A Tame Gorilla 1

CHAPTER II.

THE MAN-SHAPED APES (*continued*)—THE NSCHIEGO MBOUVÉ—THE KOOLO-KAMBA—THE SOKO—THE CHIMPANZEE.

THE NSCHIEGO MBOUVÉ—Its Nests and Habits—A Specimen Shot—Differences between it and the Gorilla—Structural Peculiarities—THE KOOLO-KAMBA—Meaning of the Name—Discovered by Du Chaillu—Its Outward Appearance and Anatomy—THE SOKO—Discovered by Livingstone—Hunting the Soko—THE CHIMPANZEE—In Captivity—On board Ship—A Young Chimpanzee—The Brain and Nerves—Anatomical Peculiarities—General Remarks upon the Group 39

CHAPTER III.

THE MAN-SHAPED APES (*continued*)—GENUS *Simia*—THE ORANG-UTAN.

Origin of the Name—Description of the Orang—Rajah Brooke's First Specimen—Mr. Wallace's Experiences in Mias Hunting—The Home of the Mias—A Mias at Bay—Their Nests, Habits, Food, and Localities—Different kinds of Orangs—Structural Points—The Intelligence and Habits of the Young—The Brain and its Case—Resemblances and Differences of Old and Young 59

CHAPTER IV.

THE MAN-SHAPED APES (*continued*)—THE GIBBONS—THE SIAMANGS—THE TRUE GIBBONS.

General Characteristics of the Species—THE SIAMANG—Its Habits and Anatomy—Distinctness from the Orangs and Gibbons—Special Peculiarities—THE WHITE-HANDED GIBBON—Where Found—Its Cry—Its Habits—Special Anatomical Features—THE HOOLOOK—Where Found—A Young One in Captivity—Shape of the Skull—THE WOOYEN APE—Its Appearance and Habits—THE WOW-WOW—Very little known about it—THE AGILE GIBBON—Reason of the Name—Peculiarities of the Anatomy—General Comparison of the Different Varieties of the Great Apes 73

CHAPTER V.

THE DOG-SHAPED MONKEYS—SEMNOPITHECUS—COLOBUS.

General Characteristics of the Monkeys of the Old World—Distinguished from the Apes by Length of the Hinder Limbs and presence of Tails—Divided into those with and those without Cheek-pouches—Use of the Cheek-pouches—The two Genera of Pouchless Monkeys—THE SACRED MONKEYS, or Semnopitheci—Derivation of the Name—

PAGE

First Discovery—Ape Worship in India—General Description—Limited to Asia—THE SIMPAI—Its Locality and Appearance—THE BUDENG—Hunted for their Fur—Its Colour and Appearance—THE LONG-NOSED MONKEY—Reason of the Name—Quaint Appearance of the Young—Anatomical Peculiarities—Their First Appearance in Europe—Description of the Nose—Peculiar Formation of the Stomach—Bezoars—THE HOONUMAN MONKEY—The Sacred Monkey of the Hindoos—Legends about it—THE DOUC MONKEY—Its Appearance and Habitat—THE BLACK-LEGGED DOUC—Anatomical Peculiarities—THE CROWNED MONKEY—THE RED MONKEY—THE SUMATRA MONKEY—THE WHITE-BEARDED MONKEY—Found in Ceylon—Its Intelligence—THE GREAT WANDEROO—Other Ceylonese Monkeys—THE GENUS COLOBUS, or Thumbless Monkeys—Description of the Hand and Wrist—Different Varieties—COLOBUS VERUS—COLOBUS GUEREZA—Their Habitat and Peculiarities—Fossil Semnopitheci . 84

CHAPTER VI.

THE DOG-SHAPED MONKEYS (*continued*)—THE GUENONS.

THE GUENONS—Where they are Found—Early Notices of them—Resemblance to the Colobi and Macaques—Distinctive Peculiarity of the Group—Often seen in Menageries—Their Terror of Snakes—Peculiar Expression of the Face—Beauty of their Skins—Minor Divisions of the Guenons—THE DIANA MONKEY—Origin of the Name—Anecdotes of their Mischief—THE MONA MONKEY—Description of one at Paris—THE WHITE-NOSED MONKEY—Origin of the Name—THE TALAPOIN—Anatomical Peculiarities—THE GREEN MONKEY—Found in Senegal in abundance—THE RED-BELLIED MONKEY—THE RED MONKEY—Observed by Bruce—THE MANGABEY—Singularity of its Appearance—Special Structural Peculiarities 103

CHAPTER VII.

THE DOG-SHAPED MONKEYS (*continued*)—THE MACAQUES.

Their Description and Anatomy, and its reference to that of the Semnopitheci and Guenons—THE COMMON MACAQUE—Its Character—Appropriateness of the Name—Occasionally an Albino—THE ROUND-FACED MACAQUE—Found in China—Ideas of the Chinese about them—THE TOQUE, OR BONNET MONKEY—THE BHUNDER—Described by Cuvier—Their Thieving Propensities—Hindoo Tales of their Sagacity—THE MOOR MONKEY—BELANGER'S MONKEY—THE PIG-TAILED MACAQUE—THE MAGOT—One of the Commonest Monkeys—Described by Galen—Early Notices of—Predatory Habits—Abundant at Gibraltar—Probably come over from Africa—Similarity to the Baboons—THE WANDEROO—Account of one in the Zoological Society's Collection—Geographical Range of the Macaques . . 114

CHAPTER VIII.

THE DOG-SHAPED MONKEYS (*continued*)—THE BABOONS.

Early Accounts of the Baboon—Origin of the Name—Held as Sacred by the Egyptians—Used as the Emblem of Thoth—Brought into Europe in the Middle Ages—Their Literature—General Description of the Family—Structural Peculiarities—Brain—Skull—Geographical Distribution—THE SACRED BABOON—Found in Great numbers in Abyssinia—Formidable Antagonists—Size and Colour of the Male and Female—Anecdotes—Propensity for Spirituous Liquors and Thieving—THE GELADA BABOON—THE PIG-TAILED BABOON—Usually called Chacma—Description of it—Its Ferocity in Captivity—Le Vaillant's Monkey—THE SPHINX BABOON—Its Dexterity of Aim—THE ANUBIS BABOON—Its Locality and Food—Method of Running—THE COMMON BABOON—Often found in Captivity—Anecdotes—Anatomical Peculiarities 129

CHAPTER IX.

THE DOG-SHAPED MONKEYS (*continued*)—THE BABOONS (2nd division).

The Second Division of the Baboons—THE MANDRILL—Easily distinguished from the rest—Peculiar Appearance and Colour of the Face—The Cheek-ridges—Noticed by the Ancients—Brutality of its Disposition—"Jerry" at the Surrey Gardens—Their Wild State—Anatomical Peculiarities—The Back-bone and Liver—THE DRILL—Distinguished from the Mandrill—Probable Antiquity of these Baboons—Theories of their Relationship to other Animals—THE BLACK BABOON—Its Locality and Description—Probably a Forest Ape—General Summary of the Dog-shaped Quadrumana and Classification of the Group 154

CHAPTER X.

THE MONKEYS OF THE NEW WORLD.

THE CEBIDÆ—THE HOWLERS—THE WOOLLY MONKEYS—THE SPIDER MONKEYS—THE SAJOUS.

The Monkeys of the New World—How Distinguished from those of the Old—Their Division into Families—The First Family, THE CEBIDÆ, with Prehensile Tails—THE HOWLERS—Appropriateness of their Name—Where Found—General Description—THE YELLOW-TAILED HOWLER—Anatomical Peculiarities and Appearance of the Face—

PAGE

Other Members of the Family—The Black Howler—Its Locality—The Woolly Monkeys—The Caparro and Barrigudo—First noticed by Humboldt—Peculiarities of the Skeleton—The Spider Monkeys—Seen by Humboldt in the Brazilian Forests—Remarkable Power of the Tail—Flexibility of the Limbs—Conformation of the Brain—Other Species—The Coaita—Curious Stories of them in Captivity—The Chameck—The Black Spider Monkey—Its Geographical Range—Its Position in Sleep—The Variegated Spider Monkey—The Sajous—The Caiarara—Observed by Bates on the Amazon—Other Varieties—The Brown Sajou—The Capuchin Sajou—Described by Brehm—Their Remarkable Dexterity and Cleverness—Diseases of Monkeys 164

CHAPTER XI.

THE CEBIDÆ *(continued)*—THE SQUIRREL MONKEYS—DOUROUCOULIS—SAKIS.

General Description of the Second Division of Cebidæ—Without Prehensile Tails—The Squirrel Monkeys—Described by Buffon and Humboldt—Peculiarities of the Species—Anecdotes by Le Vaillant—A Tragic End—The Widow Monkey—Origin of the Name—The Onappo—Its Nocturnal Habits and Peculiar Cry—The Douroucoulis, or Owl Monkeys—General Description of the Family—Peculiar Formation of the Arm-bone—The Three-striped Owl Monkey—Described by Humboldt and Bates—The Red-footed Douroucouli—The Sakis—Remarkable Resemblance in the Face to Man—Structural Peculiarities—The Couxio—The Parauacú—The Monk—Description of the Brain—Other Varieties of the Sakis—Anecdotes of them—The Black-headed Sakis—General Description 185

CHAPTER XII.

THE MARMOSETS AND TAMARINS—HAPALE—MIDAS.

The Dentition of the Genus Hapale, or the Marmosets, or Ouistitis—The Face—The Paw-like Hands and Feet—Their Claws—The Skull and Brain, and the Nature of the Diet—The Common Marmoset—Its Habits—The Cloaked Marmoset—The Genus Midas—The Tamarins—Their Dentition—The Negro Tamarin—Its Habits—Midas Argentatum—Deville's Midas—The Silky Tamarin—Notes on the Arctopithecini in General 197

CHAPTER XIII.

GENERAL REMARKS ON THE MONKEYS.

The Classification of the Monkeys of the New World—The Geographical Distribution of the Genera—The Fossil Monkeys of the New and Old World and their Alliances—The Former Old Fauna of Europe, Asia, and Africa—The Resemblance of Monkeys to other Animals and Man 203

CHAPTER XIV.

THE LEMUROIDA.

INDRIS—LEPILEMUR HAPALEMUR.

The Name of the Genus Lemur popularly given to the Group—Lemuroida the Correct Name—Their Distinctive Characters—Their Hands and Feet—Ankle-bones—Tail—*Rete Mirabile*—Nostrils—Colour of the Eye—Ears—Teeth—Brain—Resemblance to Monkeys—Their Locality—Lemur at Liberty—Its Playfulness—Division of the Lemurs—Beauties of Madagascar—Genus Indris—Described by Grandidier—Their Locality—Colour—Fingers—Teeth—The Diadem Indris—Specimens at the British Museum—Little known about it—The Woolly Lemur—Described by Sonnerat—The Short-tailed Indris—Distinguished by its Tail—Its Skull—Genus Lepilemur—Their Teeth—Tail—The Weasel Lemur—The Grey Lemur—Specimens obtained by Pollen—Their Cry 210

CHAPTER XV.

THE LEMUROIDA *(continued)*.

LEMUR—CHEIROGALE.

Called by the French *Makis*—Restricted to Madagascar—Their Activity—Different Species—How to Distinguish them—The Ring-tailed Lemur—Reason for the Name—Tail—Colour of Body—Eye—Hand and Foot—Geographical Range—Anatomical Peculiarities—Playfulness in Captivity—The White-fronted Lemur—Specimen in the Zoological Gardens—The Lemur of Mayotte—Where Found—Colour—Manner of Life—The Mongoose Lemur—Description of one sent to Buffon—The Ruffed Lemur—Described by Ellis—Domesticated Specimens—The Black Lemur—Geographical Range—Hand—Foot—Genus Cheirogale—Bushy Tails—Resemblance to the Hapalemur—Nocturnal Habits—Difficult to Distinguish—The Forked-crowned Cheirogale—Wonderful Powers of Leaping—Cry—Reason for the Name—A Nest-making Variety—Specimens in the Jardin des Plantes—Resemblance to the Galagos 225

CHAPTER XVI.

THE AFRICAN LEMUROIDA—THE GALAGOS. PAGE

The Galagos—Demidoff's Galago and the Mouse Galago—The Senegal Galago—The Sennaar Galago—The Maholi Galago—The Grand, or Thick-tailed Galago—Monteiro's Galago—The African Slow Lemurs—Van Bosman's Potto—Genus Arctocebus, or Bear Monkey Tribe—The Angwántibo—The Asiatic Slow Lemuroids—The Slow Loris—The Slender Loris—Genus Tarsius—The Spectre Tarsier, or Tarsius—The Malmag—Genus Cheiromys—The Aye-Aye—The Puzzle of the Naturalists—Opinions regarding it—Specimen Examined by Owen—Feeding—Teeth—Hands—Classification of the Lemuroida—Geographical Distribution . 236

CHIROPTERA, OR WING-HANDED ANIMALS.

THE BATS.

CHAPTER I.

INTRODUCTION—CLASSIFICATION OF BATS—THE FRUIT-EATING BATS.

One of Æsop's Fables—Opinions of the Ancients regarding Bats—Scaliger's Statement of the Puzzle—Opinions of the Middle Ages—The True Position of the Bats—The Wing of the Bat—General Structure: The Breast-bone, Arms, Fingers, "Wing-membrane," Wings, Skull, Ribs, Pelvis, Legs—In Repose—Walking—The Teats—Organs of the Senses—"Blind as a Bat"—The Eyes—Spallanzani's Experiments—The Bat's Power of Directing its Flight in the Darkest Places—Their Food—In Winter Quarters—A Battue of Bats—Frugivorous and Insectivorous Bats . . . 259

CHAPTER II.

SUB-ORDER I.—MEGACHIROPTERA, OR LARGE BATS.

PTEROPIDÆ, OR FRUIT-EATING BATS.

Characteristics of Fruit-eating Bats—Distribution—Diet—Flying Fox of Ceylon: its Habits, as described by Sir E. Tennent—The Flight of the *Pteropidæ*—Known to the Ancients—The Fruit Bats in the Zoological Gardens—Indian Flying Fox—Diet—Dissipated Habits—Great Kalong—Linnæus's Description—In their Dormitories—Nicobar, Maned, Japanese, and Grey Fruit Bats—Grey-headed Fruit Bat—Gould's Fruit Bat—Rousette—Egyptian Fruit Bat—Hottentot Fruit Bat—Maritime Fruit Bat—Margined Fruit Bat—White's Fruit Bat—Hammer-headed Bat—Harpy Bat—Greater Harpy Bat—Cloaked Fruit Bat—Dwarf Long-tongued Fruit Bat—Black-cheeked Fruit Bat—Fijian Long-tongued Fruit Bat 266

CHAPTER III.

SUB-ORDER II.—MICROCHIROPTERA, OR INSECTIVOROUS BATS.

HORSESHOE BATS AND MEGADERMS.

Insectivorous Bats—Mr. Dobson's Objection to the Name—Characteristics—Nasal Appendages—The Vespertilionine and Emballonurine Alliances—The Fur in the two Alliances—The Horseshoe Bats—General Characteristics—Distribution—Diet—Carnivorous Propensities—Greater Horseshoe Bat—General Appearance—"Nose Leaves"—Habitat—The Lesser Horseshoe Bat—Habitat—The Mourning Horseshoe Bat—The Australian Horseshoe Bat—The Orange Bat—Phyllorhinæ—The Diadem Bat—Character of their "Nose Leaves"—Captain Hutton's Account of their Habits—The Persian Trident Bat—The Megaderms—The Lyre Bat—Characteristics—Called Vampire by Europeans in India—Mr. Blyth's Account of a Megaderm's Blood-thirstiness—The Cordate Leaf Bat—The African Megaderm—The Desert Bat 279

CHAPTER IV.

VESPERTILIONIDÆ, OR TRUE BATS.

The Genus *Vespertilio* and the Family Vespertilionidæ—Characteristics: Nostrils—Tail—Ears—Dentition—Diet—Distribution—Long-eared Bat—Ears—Distribution—Asleep—In Captivity—Barbastelle—Characteristics—Distribution—Habits—Flight—In Captivity—Big-eared Bat—Townsend's Bat—The Genus *Nyctophilus*—Its True Place—Characteristics—Geoffroy's Nyctophile—Pipistrelle—Distribution—Diet—Noctule—Natural Food—Mr. Daniell's Observations—Serotine—Parti-coloured Bat—Hairy-armed Bat—Negro Bat—Kuhl's Bat—Nilsson's Bat—Coromandel Bat—Thick-footed Bat—Temminck's Bat—Welwitsch's Bat—New Zealand Bat—Mouse-coloured Bat—Natterer's Bat—Daubenton's Bat—Whiskered Bat—Black and Orange Bat—Painted Bat—Harpy Bat—Red Bat—Schreiber's Bat—Brown Pig Bat—Straw-coloured Bat. . . 292

CHAPTER V.

EMBALLONURIDÆ, OR THICK-LEGGED BATS. PAGE

Characteristics of the *Emballonuridæ*, or THICK-LEGGED BATS—CUVIER'S FURY—The Genus *Saccopteryx*—STRIPED SACK-WINGED BAT—The Pouch or Sac in the Wing-membrane—Dentition—MOUNTAIN BAT—TOMB BAT—Origin of its Name—Dentition—The Peculiar Sac or Pouch under the Chin—Other Species of the Genus (note)—EGYPTIAN RHINOPOME—Difficulty of Assigning its True Place in the System—Characteristics—GREAT HARE-LIPPED BAT—Seba's Description—Linnæus's Mistake—Dentition—Distribution—The Genus *Nyctinomus*—CESTONI'S BAT—PALE CHESTNUT MASTIFF BAT—Distribution—Habits—SMOKY MASTIFF BAT—Habits—COLLARED BAT—Hideous Ugliness—Characteristics—NEW ZEALAND SHORT-TAILED BAT—Characteristics—Mr. Dobson on the Wing-membrane, Thumb, and Foot 312

CHAPTER VI.

PHYLLOSTOMIDÆ, OR VAMPIRES.

Distinguishing Marks of the *Phyllostomidæ*—Location—Diet—Blood-sucking Propensities—Exaggerations of the Older Writers—Testimony of Azara—Darwin's Evidence—Bat-bites—The Witness of Bates, Wallace, Fraser, Prince Maximilian—Conclusion of the Whole Matter—The Desmodonts and Javelin Bat—The Tongue in the Genus *Phyllostoma*—BLAINVILLE'S BAT—Extraordinary Development of Face and Head—OWL-FACED BAT—JAVELIN BAT—Allied Species—VAMPIRE BAT—Mr. Bates' Testimony to its Inoffensiveness, and Description of its Habits—NEUWIED'S LARGE-LEAFED BAT—GREAT-EARED LEAF BAT—SORICINE BAT—REDMAN'S BAT—SEZEKORN'S LEAF BAT—SPECTACLED STENODERM—JAMAICAN STENODERM—DESMODUS—Dentition—Blood-sucking Propensities—The Bites—Stomachs of Desmodus, Frugivorous and Insectivorous Bats—Concluding Remarks 324

ORDER INSECTIVORA.

CHAPTER I.

COLUGOS—BANGSRINGS—JUMPING SHREWS—HEDGEHOGS—TANRECS—RIVER SHREWS.

Functions of the Insect-eaters in the Order of Nature—Their Leading Peculiarities—Classification—COLUGOS—Various Opinions regarding their Place—COLUGO, OR FLYING LEMUR—The *Patagium*—Parachute-like Membrane—Dentition—Offspring—Diet—BANGSRINGS—TANA—FERRUGINOUS BANGSRING—HORSFIELD'S BANGSRING—LOW'S PTILOCERQUE—SHORT-TAILED BANGSRING—JUMPING SHREWS—ELEPHANT SHREW—ALGERIAN JUMPING SHREW—PETRODROME—RHYNCHOCYON—HEDGEHOG—Characteristics—Distribution—Diet—Attacks Snakes and Vipers—Taste for Eggs and Game—Its "Spiny Skin"—"Rolled up"—Enemies—Female and Young—LONG-EARED HEDGEHOG—COLLARED HEDGEHOG—BULAU—TANRECS—TANREC—TENDRAC—TELFAIR'S TENDRAC—RICE TENDRAC—EARED EARTH SHREW—AGOUTA—ALMIQUI—WEST AFRICAN RIVER SHREW 342

CHAPTER II.

GOLDEN MOLES—MOLES—DESMANS—SHREWS.

General Description of the Golden Mole Family—Their Points of Difference from the True Mole—THE CAPE GOLDEN MOLE—Its Varieties—The Family of True Moles—THE COMMON MOLE—Described—Distribution—Teeth—Fore-limbs—Breast-bone—Not a Miserable Creature—Extreme Voracity—Diet—His Blindness a Popular Error—A Thirsty Soul—His Fortress—The Roads leading to it—Speed of a Frightened Mole—"Mole-hills"—A-wooing—His Strong Family Affections—His Persecution a Doubtful Benefit—THE BLIND MOLE—Several Allied Species—THE STAR-NOSED MOLE—Its Snout—THE COMMON SHREW MOLE—Other Species in the United States—The Family of Desmans—THE DESMAN—Its Otter-like Habits—Its Trunk—THE PYRENEAN DESMAN—THE HAIRY-TAILED MOLE-SHREW—The Family of Shrews—THE COMMON SHREW, OR SHREW-MOUSE—Superstitions about it—DEKAY'S SHREW—THE GARDEN SHREW—THE TUSCAN SHREW—THE RAT-TAILED SHREW—THE WATER SHREW—Essentially Aquatic—Its Prey—Allied Species—THE TIBETAN WATER SHREW—THE TAILLESS SHREW—Concluding Remarks—Classification—Distribution—Affinities 365

LIST OF ILLUSTRATIONS.

PAGE

Orang-utan and Chimpanzees in the Berlin Aquarium . . . . . *Frontispiece.*
Group of Apes and Monkeys, and a Lemur . . 1
American Monkey, with Prehensile Tail . . . 2
One of the Anthropomorpha—The Chimpanzee . 3
One of the Cynomorpha—The Baboon . . . 4
Group of Lemurs 5
Foot and Hand of a Monkey—A Catarrhine Monkey—A Platyrrhine Monkey--Monkey with Cheek Pouches 6
The Male Gorilla 8
Female Gorilla and Young 9
Front View of the Skull of the Gorilla . . . 10
A Family of Gorillas 13
Face of the Gorilla 15
Palm of the Foot of Young Gorilla—Back of the Hand of Young Gorilla 16
Side View of the Skull of Gorilla 17
The Teeth of the Gorilla 20
Skeleton of the Gorilla 21
Throat of Gorilla 22
Forest in the Gaboon Country—The Land of the Gorilla 24
Bones of the Fore-arm and Arm of the Gorilla—Side View. Shoulder or Blade-bone . . . 25
Hand-bones of the Gorilla 28
Hunting the Gorilla 32
Bones of the Ankle and Foot of Man—Bones of the Ankle and Foot of Gorilla 33
Young Gorilla and Dog 38
The Nschiego Mbouvé 40
Skeleton of Nschiego 41
Skull of Nschiego 42
The Koolo-Kamba 44
Portrait of a Young Soko 47
A Soko Hunt 48
The Chimpanzee 49
A Village in the Gaboon Country 52
Sick Orang-utan 53
Brain of Chimpanzee 57
Orang-utans . . . . . *To face page* 61
Front and Side Face of the Orang 61
The Orang at Bay 64
A Family of Orang-utans 65
The Orang and its Nest 68
A Young Orang 69
The Air Pouches of Orang—The Brain of Orang . 71
Wrist-bones of Orang 72
The Siamang 73
Skeleton of the Siamang 76

PAGE

Group of Siamangs and Gibbons . *To face page* 77
The White-handed Gibbon 77
Skull of Hoolook 79
The Hoolook 80
The Wooyen Ape 81
The Agile Gibbon 82
Jaw of the Gibbon—Back of Jaw of the Agile Gibbon 83
Face of the Black-crested Monkey 85
The Negro Monkey 88
The Long-nosed Monkey 89
Young Long-nosed Monkey 90
Outside View of the Stomach of Long-nosed Monkey 91
The Sumatra Monkey 92
The Doue 93
Semnopitheeus frontatus 96
The Priamus Monkey 97
Colobus Verus 100
The Guereza 101
The Diana Monkey 104
Face of the Diana Monkey 105
The White-nosed Monkey 109
The Head and Shoulders of the Talapoin . . 110
The Green and Red Monkeys . . *To face page* 111
The Red-bellied Monkey 112
The Mangabey—The Foot and Hand of the Mangabey 113
The Common Macaque 116
The Toque 117
The Bhunder, and a Bonnet Monkey . . . 120
The Moor Macaque 121
The Pig-tailed Macaque 124
The Magot 125
Wrist-bones of the Magot 126
Face of the Wanderoo 127
The Wanderoo 128
Cynocephalus 131
Judgment Scene from an Egyptian Monument . 132
Baboons upon an Ant-hill 133
Brain of the Baboon 136
The Sacred Baboon . . . . *To face page* 137
View in Abyssinia 137
The Sacred Baboon 140
Young Hamadryas 141
A Village in Nubia 142
The Pig-tailed Baboon 145
Skull of the Chacma 147
Skull of the Anubis Baboon 149
The Anubis Baboon 152
The Common Baboon 153

PAGE

The Mandrill 156
Young Mandrill 157
Skull of the Mandrill 158
The Drill 160
The Black Baboon 161
The Skeleton of the Mandrill 162
A Group of Howlers 165
Bones of the Tail of the Howler 167
Section of Head and of Air Sac of the Howler—Upper Part of Breast-bone and Collar-bones of the Howler—Brain of the Howler . . . 168
Yellow-tailed Howler and Young 169
The Caparro 170
Group of Spider Monkeys . . . *To face page* 173
Brain of the Spider Monkey 173
Jaw of the Spider Monkey 174
The Coaita 176
The Chameck 177
The Black and Variegated Spider Monkeys . . 179
The Hooded Spider Monkey 180
The Brown Capuchin 181
The Cai 184
The Callithrix Amictus 188
Arm-bone of Owl Monkey 189
The Red-footed Douroucouli 190
Brain of Monk 192
The Monk 193
The Couxio 194
The White-headed Saki 196
The Common Marmosets 197
Hand-bones of Marmoset—Foot-bones of Marmoset . 198
Deville's Midas 201
Skull of Marmoset 202
Head of the Black Howler 205
Young Orangs 209
Group of Lemuroids . . . . *To face page* 211
Lemuroids at Home in Madagascar 212
Head of Indris (Propithecus) Verrauxii, to show Lemuroid Nostrils 213
Eye of Lemuroid, showing Contraction and Dilation of Pupil—Upper Surface Brain of Lemur Catta of Natural Size 214
Side View and Under Surface of the Tongue of a Lemuroid 215
Garnett's Galago 216
Skull of Black Indris, showing Adult Dentition—Milk Dentition of Indris 219
The Diadem Indris and the Woolly Indris . . 220
The Black or Short-tailed Indris 221
The Weasel Lemur 224
The Grey or Broad-nosed Lemur 225
Ring-tailed Lemurs . . . . *To face page* 227
The Mongoose Lemur, or Woolly Macaco . . 229
The Ruffed Lemur 230
Skeleton of the Ruffed Lemur 231
Head of the Black Lemur 232
The Forked-crowned Cheirogale 234
The Maholi Galago and the Senegal Galago . . 236
Ears of Maholi Galago, contracted and open . . 237
The Muscles and Tendons of the Tail of Grand Galago—Foot-bones of Grand, or Thick-tailed Galago 238
Monteiro's Galago 239

PAGE

Palm of Hand, Garnett's Galago—Sole of Foot, with long heel, of Garnett's Galago 240
The Potto in its Sleeping and Waking Attitudes . 241
The Angwántibo 242
Hand and Foot of Arctocebus 243
The Slow Loris 244
A Rete Mirabile—Slow Loris 245
The Slender Loris, showing its Attitudes and Habits 247
The Tarsius 249
The Aye-Aye 251
Forest Scene in Madagascar 253
Bones of the Hand and Foot of Aye-Aye . . . 256
Skull of the Aye-Aye (side and front view) . . 257
Marsh Bat 258
Skeleton of the Mouse-coloured Bat 260
The Sternum of Flying Fox 261
Barbastelle Walking—Head of Long-eared Bat . 263
Head of the Spectacled Vampire 264
Head of the Kalong 266
Fruit Bats of Ceylon at Home . . *To face page* 267
Dentition of the Egyptian Fox-Bat 267
Representation of a Fruit Bat on an Egyptian Monument 269
Collared Fruit Bat with Young 270
Kalong 272
Head of the Maned Fruit Bat—Head of the Grey Fruit Bat 273
The Roussette 275
Head of the Margined Fruit Bat 276
The Hammer-headed Bat 277
Teeth of the Dwarf Long-tongued Fruit Bat . . 278
The Black-cheeked Fruit Bat 279
Hairs of Bats, Magnified 280
Head of the Greater Horseshoe Bat 281
The Greater Horseshoe Bat 282
Head of Lesser Horseshoe Bat 283
Head of the Mourning Horseshoe Bat . . . 284
The Orange Bat 285
Head of the Male and Female Diadem Bat . . 286
Head of the Persian Trident Bat 287
Head of the Lyre Bat—Teeth of the Lyre Bat . . 288
Head of the Cordate Leaf Bat—Head of the African Megaderm 289
The African Megaderm—Head of the Desert Bat . 290
The Desert Bat 291
Dentition of the Thick-legged Bat 292
British Bats at Home . . . *To face page* 293
Long-eared Bats in Flight 293
Long-eared Bat Sleeping 294
Head of Barbastelle 295
Ear and Head of Townsend's Bat 296
Geoffroy's Nyctophile 297
Pipistrelle in Flight 298
Head of Noctule 299
Head of Parti-coloured Bat 301
Head of Temminck's Bat—Welwitsch's Bat . . 303
New Zealand Bat 304
Head of Mouse-coloured Bat 305
Black and Orange Bat 307
Skull of Harpy Bat—Skull of Red Bat . . . 309
Foot and Thumb of the Brown Pig Bat . . . 311
Head of Straw-coloured Bat 312

PAGE

Dentition of Striped Sack-winged Bat—Wing of Striped Sack-winged Bat, from below—Arm of Striped Sack-winged Bat, from above . . 313
The Mountain Bat 314
Skull of Tomb Bat—Dentition of Tomb Bat . . 315
Head of Male and Female Long-armed Bat—Head of Male and Female Black-bearded Bat—Skull of Rhinopome 316
Egyptian Rhinopome—Head of Great Hare-lipped Bat 317
Skull and Front Teeth of Cestoni's Bat . . . 318
Head of Cestoni's Bat 319
Head of Collared Bat 321
The Collared Bat 322
Head of New Zealand Short-tailed Bat—Teeth of New Zealand Short-tailed Bat—Thumb and Foot of New Zealand Short-tailed Bat . . . 323
The New Zealand Short-tailed Bat 324
Skull of Javelin Bat 325
Mouth of Spectacled Stenoderm—Head of Blainville's Bat 328
Skull and Dentition of Blainville's Bat—Blainville's Bat 329
Head of Owl-faced Bat 330
Head of Javelin Bat—Head of Vampire Bat . . 331
Head of Soricine Bat 333
Redman's Bat 334
Skull of Desmodus 338
Desmodus 339
Stomach of Desmodus—Stomach of Long-eared Bat—Stomach of Pteropus 340
Low's Ptilocercque 342

PAGE

Skeleton of Shrew—Dentition of Hedgehog . . 343
Hind Foot of Colugo—Bones of Hind Foot of Colugo 345
Lower Incisors of Colugo—Colugo 346
Skull of Colugo 347
Dentition of Ferruginous Bangsring—Tana, Golden-tailed Variety 348
Sole of Right Hind Foot of Elephant Shrew—Elephant Shrew 351
Sole of Right Hind Foot of Petrodrome—the Rhynchocyon 352
The Hedgehog 354
The Bulau 358
1. Tendrac; 2. Telfair's Tendrac; 3. Tanrec *To face page* 359
Dentition of Tanrec 359
The Agouta 362
Upper Jaw of West African River Shrew . . 363
Lower Jaw of West African River Shrew—The West African River Shrew 364
Skull of Golden Mole—Dentition of Golden Mole . 365
Sternum of Golden Mole—Fore Foot of Golden Mole 366
The Common Mole 367
Dentition of Common Mole—Fore Limbs of Common Mole—Sternum of Common Mole . . . 368
Mole's Fortress 370
Side View of Snout of Star-nosed Mole—Front View of Snout of Star-nosed Mole 373
Dentition of Desman 375
1. Pigmy Shrew; 2. Common Shrew; 3 and 4. Water Shrew . . . . *To face page* 377
Dentition of Common Shrew 377
Rat-tailed Shrew 379

INTRODUCTION.

THE Natural History of Animals has always been a most interesting and instructive subject, and its popularity increases year after year. It is a branch of knowledge which is entertaining at every age, and it is a favourite study with men of every race and country, and of every intellectual capacity. All children delight in having their little tasks associated with pictures of animals, and the alphabet is learned all the more readily by its being illustrated with spirited drawings of household pets and the terrible creatures of the woods. The marvels of the intelligence of the dog and horse are inexhaustible sources of delight to young readers; and there are few greater pleasures than those which are felt when living animals, whose descriptions and habits have been the subject of instruction and amusement, are seen in some large menagerie or zoological gardens. On the whole, it is probable that few books are so interesting to young men and women as those which relate to animals, and it is their study which, in the majority of instances, leads to the desire for further knowledge of Natural History. The young student soon begins to yearn for information regarding the manner in which different creatures live; how some breathe air, how others live in water; how it is that some fly and others crawl; and he desires to connect the peculiar construction of animals with their method of life. Or he may be content with endeavouring to understand the names of animals, and the reasons why they are arranged or classified in a particular manner by scientific men.

As years roll on, if the interest in Natural History has not diminished, the man, with increasing intelligence and scope of reading, masters the knowledge desired in his youth, and has the opportunity, should he care to grasp it, of the highest intellectual enjoyment. He can enter into the consideration and discussion of the mysterious problems of life: of its origin; of the reasons why animals differ; why they are distributed here and there, or limited in their position in the world; what connection there may be between those of the past and of the present, and of the relation between the creation and the Creator.

Besides this, even should he not aim so high, the man who has had a slight training in Natural History often employs his knowledge for the benefit of art and commerce. How beautiful are the representations of animals on some old coins, how grotesque are those on others! Yet the most correct, and, therefore, the most beautiful, were the result of the careful study of Nature. What benefits to men have resulted from the production of certain breeds of horses, sheep, and oxen! But it has been the study of Nature, and of the laws of the powers of inheritance, which led to most of these results: and thus the practical man is dependent upon the student for his success.

Notwithstanding the interesting nature of the study of the Natural History of Animals, there is certainly more interest taken in it during early life than later on. As a rule, men have no time for it,

or they find that, after gaining a certain amount of knowledge, they must study hard if further progress is to be made. Moreover, the vast amount of useless things which had to be learned at school and college have no relation to Natural History, except, perhaps, to convey erroneous ideas and to teach fables, so that this important science has usually to be commenced in earnest after the usual education has been completed. When the determination has been made to learn the Natural History of Animals, the student will have to study two separate, yet inter-dependent, branches of knowledge, namely, Zoology and Comparative Anatomy: for the one considers the external shape, habits, distribution, and classification of animals, and the other refers to their internal construction, anatomy, and physiology, and the relation which the internal parts bear to the external in the scheme of classification. These studies are evidently inseparable.

Now, it is the fact that, owing to the importance of Comparative Anatomy to those who study the Anatomy of Man, it is much more frequently learned than simple Zoology. Comparative Anatomy is useful to the medical man, but Zoology is not, and therefore the majority of students whose previous education has led them up to Natural History care but little for the classificatory part. It is equally true that the names and the apparently complicated methods of expression used by zoologists deter most people from the study. If this is a correct view of the relation of the Natural History of Animals to our education, and to the advance of our intellectual culture, it is evident that there is a weak point in the method of the instruction of this charming science during that age when young people begin to inquire for more solid information. The story-book has been read, and the heavy work on Zoology and Comparative Anatomy is as yet sealed, and hence books are required in advance of the one and which will lead up to the other—books which, whilst they entertain, instruct and convey, in simple language, the results of the best and latest scientific inquiries. This kind of literature should, moreover, be sufficiently meritorious to attract the general reader who may desire information in any particular portion of the Natural History of Animals.

The book, of which this is the Preface, has been written in order to obviate the difficulties which have been alluded to, and to form a useful and entertaining Natural History of Animals. It is the result of the work of several English naturalists—of men who have felt the want of such a book in their own studies, and who have had to encounter the difficulties which it is trusted that it will remove. Every endeavour has been made to explain the most interesting facts simply and correctly, and to unite the studies of Zoology and Comparative Anatomy. The anecdotes of the instinct and habits, and of the methods of the capture of animals, have been given so as to illustrate particular gifts and the actions of important organs and structures.

The plan of this Work is not to open with a classification of animals, the majority of whose names and shapes are entirely unknown to the reader, but to describe the shape, nature, and habits of groups of creatures, and then, when they have become familiar, to arrange and classify them. For the same reason, an introduction, dealing with the nature and importance of Natural History studies, with the abstract ideas of classification, and with the explanation of the necessity of dividing the Animal kingdom according to the principles of Comparative Anatomy, is not given until the work is tolerably advanced; but an arrangement has been made so that this important part can be subsequently introduced in its usual place.

The facts of the Natural History of Animals and their explanations will thus be placed prominently, and will precede the classification.

It is necessary, however, to make a few observations on what is termed classification and its nature. Animals are classified by their resemblances and differences. Those creatures which resemble each other more than others are grouped together, and are separated from dissimilar groups. The first act in classification is to distinguish one animal from others by differences in the shape and internal construction, and the second is to group together the beings whose differences are small. A kind or species is a letter of the Zoological Alphabet, and it is usually said to refer to beings which produce others like unto themselves. A genus is a group of species closely resembling each other; a word in zoological language made up of a few or many letters of the alphabet. There may be few or many species in a genus, and whilst some of them very closely resemble each other, others are not quite so much alike; and these link on one genus to another. The notion of a genus is to include a number of kinds in a group which has a character given to it: that is to say, certain peculiarities of shape and of anatomy. It will be obvious that the genus is an artificial affair, and is necessary for the purpose of making science easy.

In order to explain this, look at a domestic cat, a lion, a tiger, a leopard, and a cheetah, and it will be observed that there are differences between them in shape and colour which cause them to be separated into distinct *species*. They all have some points of construction in common; and, therefore, they are classified together as five species of a *genus*—the genus *Felis*.

Then consider the figure and colour of a hyena, and of a civet, and study their internal anatomy, and it will be found that although there are differences between them which are sufficient to necessitate the placing of the hyenas in one genus (*Hyæna*), and the civets (*Viverra*) in another; yet the genera are closely united or allied, in consequence of their possessing many similarities.

On comparing the genus *Felis* with the genera *Hyæna* and *Viverra*, it will be noticed that the last two resemble each other more than they do the first, and thus two *families* are formed. One the Felina to comprehend the genus *Felis;* and another the *Viverrina*, to include the genera of hyenas and the civets. But the slight resemblance between these families is sufficient to cause them to be grouped in an *order* which is called Carnivora, or that of carnivorous beasts.

Again, the Monkeys and Sloths do not resemble each other in shape and internal construction sufficiently to be placed in the same order even, but they and the Carnivora, and many other animals, suckle their young. They may, therefore, be separated, in a classification, from other animals which fly and lay eggs, and do not suckle: as the birds. The birds form one *class*, and the Mammalia, or animals that suckle their young, form another. Other classes are formed by the Reptiles, Amphibia, and Fishes.

All the animals of these numerous classes have a back-bone; but if we examine a nautilus, a snail, a beetle, a worm, a coral, or an animalcule, nothing like an internal skeleton made up of bones, some of which are placed inside the back, can be discovered. Hence all the animals can be arranged into two *sub-kingdoms*, those with and those without back-bones, or the Vertebrata and the Invertebrata. (The name *vertebrata* is taken from the Latin word *vertebra*, which means a turning-joint in the body, or a back-bone.) Those are the sub-kingdoms of the animal *kingdom*, which is so called in contradistinction to the *kingdom* of plants.

It must be remembered, however, that the best classification is but an attempt of a finite understanding to arrange the infinitely variable things of Nature. It is but an artificial and arbitrary arrangement which is necessary for study: for were the whole truth before us, there would be no

classification which would depend on marked differences in shape and internal construction. Were the figures and anatomy of every animal that has lived, and of every creature which is now living on the globe, placed before us, the gaps which enable one genus to be separated from another would be filled up, and even species would cease to be distinguished. But, in spite of the artificial nature of the classifications, there is this to be said of them: that they give some faint indications of the philosophy of creation. The differences and resemblances of animals relate to structures of the body which have been inherited from creatures that lived in the remote past; and we glean this when it is known that the young unborn of one genus resemble the old and fully-formed creatures of kinds belonging to other classes which preceded it in the history of the globe, and when it is shown by the microscope that some of the parts of the bodies of the most insignificant animals of the invertebrate sub-kingdom resemble those of the most gifted of animals.

A classification thus opens out a little of the scheme of Nature, and it proves that the resemblances and differences of animals are not matters of chance, but that there is a law which has produced them. Such a law, as yet but imperfectly comprehended, is Man's idea of the action of the will of the Divine Creator.

CASSELL'S NATURAL HISTORY.

GROUP OF APES AND MONKEYS, AND A LEMUR.

I.—QUADRUMANA.—THE APES AND MONKEYS.

CHAPTER I.

INTRODUCTION—THE MAN-SHAPED APES—1. THE GORILLA (*Troglodytes Gorilla*).

The World of Monkeys, and its Division into great Groups—Distinction between the Old World and New World Monkeys—Classification of Monkeys—The GORILLA, Ancient and Modern Stories about it—Investigations of Savage and Du Chaillu—General Description—The Head, Brain, Teeth, Taste, Smell, and Voice—The Air Sacs, and Ear—The Limbs and Muscles—Method of Climbing—Diet—Hunting the Gorilla—Attempts to Capture Alive—A Tame Gorilla.

IF one of each kind of the Apes and Monkeys which are now living on the globe could be collected and placed in a large zoological garden, and if those which lived in former ages, and whose skeletons have been discovered by geologists, could be brought to life, and added to the whole, they would certainly form a very amusing and remarkable assemblage. What endless fun there would be, what scamperings, skirmishes, and quarrels would take place; how they would grin, chatter, and pull tails all the live-long day; and as evening began, how some, which had been quiet spectators before, would commence howling, and how others would rush about amongst their tired and sleepy companions, with noiseless bounds until the return of daylight.

If each of these representative Monkeys could give an account of itself, whence it had come, how it lived in its native forests and woods, and what it did with itself all day, a most interesting and

novel Natural History book could be compiled, for only the histories of a few have been written, and they are by no means always veracious. They would have come from Asia and many of its islands, from Africa, from South America, and the Isthmus to the north, and Europe would have sent one from the rocks of Gibraltar; and yet, unless those of the same country had been properly introduced, either by Dame Nature or by the chapter of accidents incident to such a very unlikely meeting as we are imagining, they would not know many of their fellows. They are exclusive in their habits, and their particular parks and forests are limited in extent, and sometimes very much so. Of course, there are some exceptions, and many kinds which roam over large countries, and are even found in different islands, have gained the superior intelligence and the ready affability and easiness of intercourse characteristic of the cosmopolitan and traveller. Every kind of temper and capacity would be shown; the Gorillas would probably be shy and cross, the Chimpanzees lively and kind, the Baboons grumpy, the Spider Monkeys restless, and most of the

AMERICAN MONKEY, WITH PREHENSILE TAIL.

Macaques impudent and cunning—the result of a knowledge of Apes and of many Monkeys. There would be every shade of colour, and of shape and size; there would be many without tails, some with stumps, and others with long tails of no great use except to afford temptation to the mischievous; and not a few with fine large ones useful in the extreme, by acting as a fifth limb. Many would have very human faces and sharp eyes, others would look more like dogs, and fierce enough, and there would be every variety of posture. Some would sit very well, others would go on all-fours, and there would be others swinging with their long and strong arms, and making tremendous jumps and bounds assisted in some by the prehensile tail. Some would want one kind of fruit, and others different kinds of vegetables, but only two or three tiny little ones would care much about grubs and eggs. All would have the very best possible limbs for climbing, grasping, picking, and stealing, and all would have good hands, that is to say, fingers and thumbs and wrists, in front, and foot-hands, that is to say, feet with a great thumb-like toe behind. In a general sense they would all be four-handed or Quadrumanous, and this peculiarity would distinguish them from any interlopers who might have got into the assemblage unasked.

It may be doubted whether the most scientific of the scientific could do much in the way of science at first with such varied and amusing creatures before him; but the mind will attempt to compare and notice differences under all sorts of circumstances, and therefore some general truths would

possibly be got at amidst all the noisy debates, divisions, and cheers and counter-cheers of this Apes' Parliament. There would be clearly two sides to this house of representatives, the Americans and the Old World-ites, and the most uncritical observer would separate them. It never entered into the mind of a Monkey of the Old World to have a tail which would be as useful as another leg and hand, and as manageable as if it had an eye at its tip—that is an invention of Dame Nature in the American tropics, and is an evident improvement. Now this tail is visible enough, and so is another American peculiarity. The Monkeys there have a broad end to the nose, and the openings of the nostrils look outwards, being separated by a thick gristle; but those of the Old World have a thin gristle in the same place, and the nostrils are not wide apart but open in front, more or less like those of men and dogs. Here are, then, two "parties," those with nostrils wide apart with a wide and thick gristle—"broad

ONE OF THE ANTHROPOMORPHA—THE CHIMPANZEE.

noses," called in scientific language "Platyrrhines*"; and those with the nostrils "looking downward," or "Catarrhines."†

The great American section, or that of the broad-noses, is split up to a certain extent, for all have not long prehensile tails, those of some being short; and others have them feeble in strength and almost brushy with fur. Here are, then, the means of readily knowing one set from another, so far as these far travelled Monkeys are concerned.

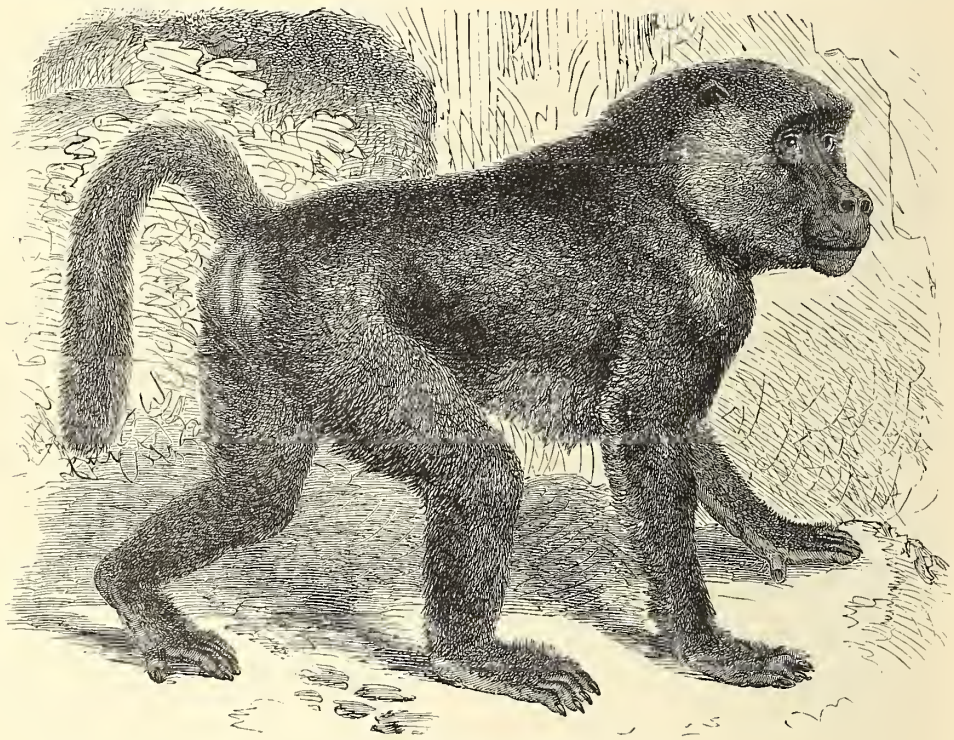
The Old World section, with its close and downward-looking nostrils, at first sight appears very united, but after a little noticing there seem to be many different groups in it. Firstly, the commonest kinds make up for the absence of a clinging tail, such as their American cousins have, by having something which the Transatlantics would be glad of, namely, cheek pouches—comfortable receptacles for nuts and such delicacies within the mouth, where food can be kept as in a cupboard, until it

* πλατυς, flat or broad; ῥινές, nostrils. † κατά, downwards; ῥινές, nostrils.

is required, or can be enjoyed in safety. These are the valuable properties of many of the smaller African tribes. Then they also have, in the absence of soft clothes and comfortable chairs to sit upon, fur or hair and a natural hardness or "callosity," or seat, which does not wear out, and which is often strangely coloured. Another group has no cheek pouches, but it possesses the callosities, and these less favoured creatures come mainly from Asia and the great islands, and only a few from Africa.

Finally, the most important group of the section consists of the large Apes, with neither tails, callosities, nor cheek pouches, but having very man-like features; for instance, the great Troglodytes, Chimpanzees, and Orangs, the first two from Africa, and the last from the great Asiatic islands and the mainland.

These tribes could be, with more study (especially if the merry company were broken up by the



ONE OF THE CYNOMORPHA—THE BABOON.

anatomist taking them one by one and dissecting them), divided over and over again, and separated into kinds or species, which would not, however, always tally with the corresponding arrangement of the naturalist, who would go by the skin and the outside of the animals.

One thing would be quite clear to every one, and that is that some of the creatures greatly resemble man at first sight, and that although this likeness diminishes with study, still there is a group, which deserves the title of the "man-shaped." Others form a group which go usually on all fours, looking like dogs, more or less, and they are the "dog-shaped," but they of course retain the more or less man-like peculiarities which characterise the whole of the Monkeys.

Hence, after all these divisions and differences and resemblances have been mastered, it would be found that the noisy assemblage could be arranged as follows:—

1.—Catarrhines.—Old World Monkeys, man-shaped and dog-shaped.

2.—Platyrrhines.—New World Monkeys.

The first section, the *Catarrhines*, may be divided into the man-shaped, or in the Greek the *Anthropomorpha*, and the dog-shaped, or the *Cynomorpha*.

Or they may be arranged as those, with: 1, cheek pouches and callosities, for instance, the Baboons; 2, those with callosities only, the Monkeys; and 3, those without either, and without a tail, the Apes.

The second section, or the *Platyrrhines*, may be divided into those: 1, with prehensile tails; and 2, those with the tails not prehensile; and 3, those whose tail is furry.

This great array of manikins (whence they get their name of Monkey—the word *homunculus*, "a sorry little fellow," having possibly something to do with it) is formed by creatures next to man, the highest in the scale of animals. They could be very readily distinguished from all others, were it not for the existence of a group of beings which resemble them in some particulars. These are the next lowest in the scale, and they have thumbs on the hands and thumb-toes on the feet, but their fur is woolly, and they are cat-like in shape. They are called the Lemurs, or by some zoologists "Half Apes." These Lemurs only resemble in a slight degree some of the

GROUP OF LEMURS. (From the *Transactions of the Zoological Society*.)

Monkeys of the New World, but they are more like them than any other animals, and therefore are classified with them.

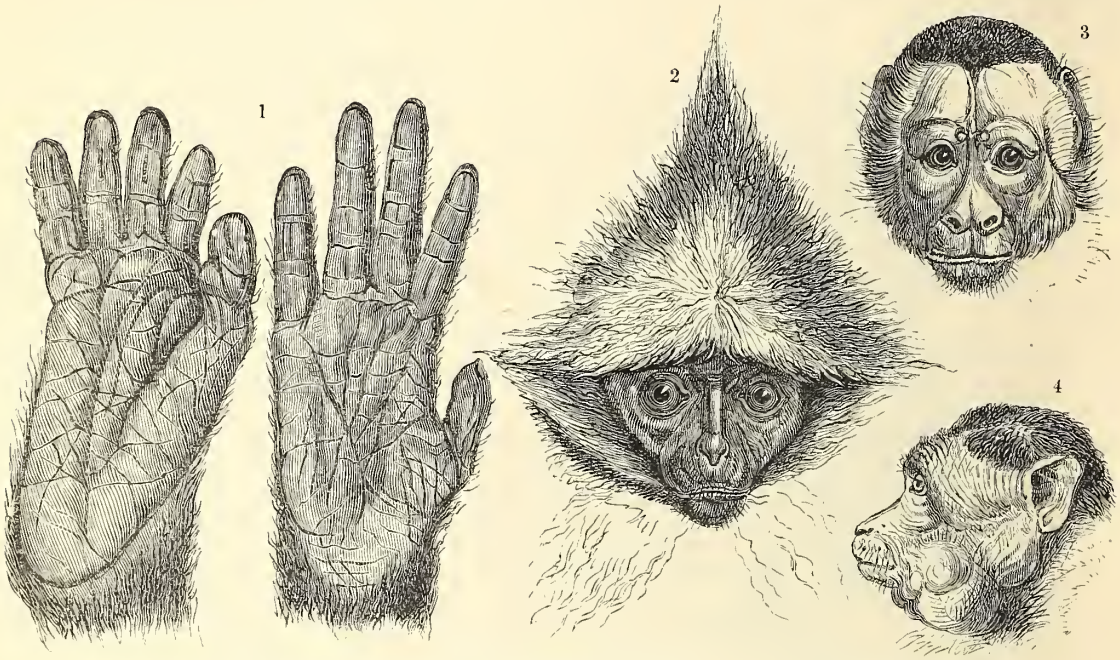
The order of beings to which these various creatures belong is known by the name of "Primates," which implies the rank they hold in the scale of creation. Man stands first, very distinct in his intellectual powers and spiritual gifts from the most intelligent of the Quadrumana and as much superior to them in his construction. Then comes the world of Monkeys, the "man-shaped" at the head, and the little marmosets, with furry tails, at the bottom of the array, and linked on to these are the Half Apes or Lemurs. They all form a great order of the animal kingdom which stands first and at the head of all other orders of the animal world.

But what would the old Monkeys whose bones have been dug out of strata which are older than the Himalayan mountains and the Alps say could they visit such a collection as that suggested? They would recognise their fellow-monkeys, but would look upon them as pigmies in size. They would be few in number, for though Monkeys go the way of all flesh very rapidly, skeletons of them are very rarely found, so rarely indeed that many Indians believe that the other Monkeys bury them. The fact is, that there are plenty of Jackals, to say nothing of birds of prey, ready to snap up a dead, dying, or invalid Ape, and to turn its protoplasm into their own. Some few tumble into holes, and may be preserved there, and probably that was how the old bones were hidden up. The old kinds resembled the new more or less, but for the most part those which have been carefully examined

were larger than the corresponding modern species. They were as great Apes in their nature as are the present, and had this advantage, that their roaming ground was greater, for they lived in Europe as well as in the countries where their modern representatives are found. Nevertheless, even in those old days the Catarrhines were kept to the Old World, and the Platyrrhines enlivened the American forests alone.

In the great order of the primates, after man, stand the man-shaped or anthropomorphous * Apes, the great tail-less. They are inhabitants of equatorial Africa, and of the great Asiatic islands and the adjacent mainland, and first and foremost amongst them is the African Gorilla.

Africa, to the south of the great desert, has always been a country of wonders, and highly attractive to imaginative and restless men ; and its dark population, so ignorant and superstitious, has,



1. FOOT AND HAND OF A MONKEY. 2. A CATARRHINE MONKEY. 3. A PLATYRRHINE MONKEY. 4. MONKEY WITH CHEEK POUCHES.

from its love of the marvellous, shadowed the truth with much mystery. Hence, travellers in those tropical regions, which are so fatal to Europeans, have from the earliest times told of the man-like creatures they had heard of and sometimes seen ; and they have associated them in the equatorial part of the continent with human dwarfs, pigmies, and monsters. For centuries these degraded human races have been sought after, and now whilst it is admitted that dwarfed men exist, it has come to light that most of the stories which led to the belief in their hideous associates were derived from the existence of large man-like Apes—creatures of dread to the natives—whose traditions are full of credulous anecdotes about them. Hidden in the recesses of vast forests, where the silence of nature is intense, and moving with great activity, where men can hardly follow, these animals acquired most doubtful reputations, and their ugly personal appearance, so suggestive of violence, was magnified in every way in the eyes of the timid natives.

So dreaded were these Apes, and so environed were they with a superstitious mystery, that Europeans had travelled and traded close to their haunts for centuries before one of them was seen by any other eyes than those of the timid negroes. Many stories about them had long been

* Ἄνθρωπος, man ; μορφή, form or shape.

told, and indeed some of them are as old as the days of the Carthaginians. For instance, Hanno, a Carthaginian, was ordered to sail on a voyage of discovery round Africa some centuries before Christ, the exact date not being fixed; and he sailed and rowed in his galleys out of the present Straits of Gibraltar, and coasted southwards until he came to the great bay, probably somewhere about the Gaboon River, near the equator, in Western Africa. It is stated in the history of his voyage:—

"On the third day, having sailed from thence, passing the streams of fire, we came to a bay called the Horn of the South. In the recess there was an island like the first, having a lake, and in this there was another island full of wild men. But much the greater part of them were women with hairy bodies, whom the interpreters called Gorillas. But, pursuing them, we were not able to take the men; they all escaped, being able to climb the precipices, and defended themselves with pieces of rock. But these women (female Gorillas), who bit and scratched those who led them, were not willing to follow. However, having killed them, we flayed them, and conveyed the skins to Carthage, for we did not sail any further, as provisions began to fail."

Probably the streams of fire were a part of a volcanic eruption. Written in the *Periplus* or voyage of Hanno this story is thoroughly African, and might have been the model upon which hundreds of later ones have been formed, for it is a combination of the novel in nature, and of what is true and false. It is curious that a commander of so civilised an expedition, and a man whose eyes had been accustomed to the grace of Grecian statuary and to the beauty of his own countrywomen, should have mistaken a Gorilla for one of the fair sex; and, moreover, it is possible that from the mounting of the rocks, and the flinging of stones by the males, the whole were Baboons. Nevertheless this is the oldest record of the name which is associated with the most interesting of modern discoveries, and it accounts for many stories which were kept floating in the thoughts of successive generations of travellers.

Gradually the truth came forth, but not until many Europeans had wandered in Gorilla Land. One Andrew Bartlett was an English sailor, who got caught by the Portuguese for some reason or other, and was kept a prisoner in Angola, which is situated nearly ten degrees south of the line, and near the great virgin forests, which are the haunts of the Gorilla and Chimpanzee, and his "strange adventures" were published in 1625, by Purchas, in "His Pilgrimages."

Battel speaks of two monsters which excited the fears of the natives. "The greatest is called *Pongo*, in their language, and the lesser is called *Engeco*. This Pongo is in all proportion like a man, but that he is more like a giant in stature than a man: for he is very tall and hath a man's face, hollow eyed, with long haire upon his brows. His bodie is full of haire, but not very thick, and it is of a brownish colour. He differeth not from man but in his legs, for they have no calfe. He goeth always upon his legs, and carrieth his hands clasped on the nape of his necke, when he goeth upon the ground. They sleepe in the trees, and build shelter for the raine. They feed upon the fruit that they find in the woods, and upon nuts, for they eat no kind of flesh. They cannot speak, and have no understanding more than a beast. The people of the countrie, when they travaile in the woods, make fires when they sleepe in the night: and in the morning when they are gone, Pongo will come and sit about the fire till it goeth out, for they have no understanding to lay the wood together. They goe many together and kill many negroes that travaile in the woods. Many times they fall upon elephants which come to feed where they may be, and so beat them with their clubbed fists and pieces of wood that they will runne roaring away from them. These Pongos are never taken alive, because they are so strong ten men cannot hold one of them; but they take many of their young ones with poisoned arrows. The young Pongo hangeth on its mother's belly with its hands clasped about her, so that when any of the country people kill the females, they take the young which hangs fast upon his mother. When they die amongst themselves, they cover the dead with great heaps of boughs and wood, which are commonly found in the forests."

The Pongo appears to be the Gorilla, and Battel tells much truth about it, mixed up with absurd fiction, whilst the Engeco, or as it is called by the natives of the Gaboon, the *enche-eko*, is the Chimpanzee.

Early in this century, in 1819, Bowditch says, in a description of a mission from Cape Coast Castle to Ashantee, "that the favourite and most extraordinary subject of conversation when in the

Gaboon River was the *Ingena*. This is an animal like the Orang-outan, but much exceeding it in size, being five feet high and four feet across the shoulders. Its paw was said to be even more disproportioned in its breadth, and one blow of it is said to be fatal. It is commonly seen by the natives

THE MALE GORILLA.

when they travel to Kaybe, lurking in the bush to destroy passengers, not to eat them, for it feeds principally on wild honey, which abounds."

Sometimes, the natives assert, when a company of villagers are moving rapidly through the shades of the forest, they become aware of the presence of the formidable Ape by the sudden

disappearance of one of their companions, who is hoisted up into a tree, uttering, perhaps, only a short choking sob. In a few minutes he falls to the ground a strangled corpse, for the animal, watching his opportunity, has let down his huge hind-hand and seized the passing negro by the neck with a vice-like grip, and has drawn him up into the branches, dropping him when life and struggling have ceased.

The missionaries, when they were established in the Gaboon region, found that all along the coast the Gorillas were believed by the natives to be human beings, members of their own race degenerated. Some natives who had been a little civilised, and who thought a little more than the rest, did not acknowledge this relationship, but considered them as embodied spirits, the belief in the transmigration of souls

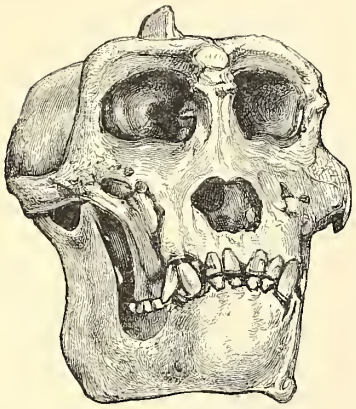
FEMALE GORILLA AND YOUNG. (From the *Transactions of the Zoological Society of London.*)

being prevalent. They said that the *enche-eko*, or Chimpanzee, has the spirit of a *coastman*, being less fierce and more intelligent than the *enge-ena*, or Gorilla, which has that of a *bushman*. The majority, however, fully believed them to be men, and seemed to be unaffected by the arguments offered to disprove this fancy; and this was especially true of the tribes in the immediate vicinity of the locality. They believed them to be literally wild men of the woods. Nevertheless, they were eaten when they could be got, and their flesh, with that of the Chimpanzee and other Monkeys, formed and still forms a prominent place in the bill of fare.

Impressed thus with a belief in their kinship and of their ferocity, it was not surprising that live Gorillas could not be obtained by European travellers. Even a bold and skilful hunter of the elephant, when pressed to bring in one, declared he would not do it for a mountain of gold.

In 1847 the first sight of a part of a Gorilla was obtained by an American missionary; it was a skull, and its shape struck him as being so extraordinary that he believed the natives were correct in attributing it to the much-talked-of Ape of whose ferocity and strength he had heard so much.

Collecting others, he at last handed them over to a fellow labourer, Dr. Savage, who possessed much anatomical knowledge. Every attempt was made to obtain even a dead Gorilla, but without satisfactory results. Savage lived for years in the neighbourhood of the Gaboon river, and not only gradually accumulated a fine collection of the bones of the great Ape, which he at first thought was the Orang Outan, and which he subsequently described as the Gorilla, but also put together a history of its habits and aspect as gleaned from the natives. He was in the heart of Gorilla Land, which may be said to extend from ten to fifteen degrees of latitude on either side of the equator. It is bounded by the sea on the west, and extends to an unknown distance to the east, being watered by the Gaboon, Danger, and Fernandez Vas rivers. Mountainous far from the coast, and very undulating everywhere, it consists of dense forest, wild jungle, and open places. Traversed as this country is by navigable rivers which are visited by traders, it struck this observer that it was indeed remarkable that the Gorilla should have been so unknown to civilised men; but he was soon impressed with the dread the natives had of it, and also with the fact that it sought the remoter parts of the neighbouring woods. From the descriptions of the natives, who never attempted to interfere with the Gorilla except in self-defence, its height is above five feet, and it is disproportionately broad across the shoulders. It is covered with coarse black hair, which greatly resembles that of the Chimpanzee; with age it becomes grey, and this fact has given rise to the report that there are more kinds than one. Resembling a huge Ape in shape, with a great body, comparatively short legs with large hind-thumbs, its bulk is considerable, and its arms, reaching further down than in man, enable it to grasp and climb well. It does not possess a tail, and the head has a wide and long black face, a very deep cheek, great brows over the deeply-seated hazel eyes, a flat nose, and a wide mouth with very strong teeth. The top of the head has a crest of longish hair, and elsewhere it is exceedingly thick and short. The belly is very large. From inquiry he ascertained that when walking, their gait is shuffling, and the body, which is never upright like that of man, moves from side to side in going along. Usually it walks by resting the hands on the ground and then bringing the legs between them, and swinging the body forward. They live in bands, and the females generally exceed the males in number. They are exceedingly ferocious, never running away from man, and the few that have been captured were killed by elephant hunters and native traders as they came suddenly upon them whilst passing through the woods.



FRONT VIEW OF THE SKULL OF THE GORILLA.

It was said, at this time, by the natives, that the Gorilla makes a sleeping-place like a hammock, by connecting the branches of a sheltered and thickly-leaved part of a tree by means of the long, tough, slender stems of parasitic plants, and lining it with the dried broad fronds of fern, or with long grass. This hammock-like abode may be seen at different heights, from ten to forty feet from the ground, but there is never more than one such nest in a tree. They avoid the abodes of man, but are most commonly seen in the months of September, October, and November, after the negroes have gathered in their outlying rice-crops, and have returned from the "bush" to their valleys. So observed, they are described to be usually in pairs, or if more, the addition consists of a few young ones of different ages and apparently of one family. The Gorilla is not gregarious. The parents may be seen sitting on a branch resting their backs against the tree trunk munching fruit, whilst the young Gorillas are at play, leaping and swinging from branch to branch with hoots or harsh cries of boisterous mirth. This rural felicity, however, has its objectionable sides, for occasionally, if not invariably, the old male, if he be seen in quest of food, is usually armed with a short stick, which the negroes aver to be the weapon with which he attacks his chief enemy the elephant. Not that the elephant directly or intentionally injures the Gorilla, but deriving its subsistence from the same source, the Ape regards the great proboscidian as a hostile intruder. When, therefore, he sees the elephant pulling down and wrenching off the branches of a favourite tree, the Gorilla, stealing along the bough, strikes the sensitive proboscis of the elephant with a violent blow of his club, and drives off the startled giant trumpeting shrilly

with pain. In passing from one tree to another the Gorilla is said to walk semi-erect with the aid of his club, but with a waddling and awkward gait; when without a stick, he has been seen to walk as a man, with his hands clasped across the back of his head, instinctively balancing its forward position. If the Gorilla be surprised and approached, whatever the ground may be, he betakes himself on all-fours, dropping the stick, and makes his way very rapidly, with a kind of sidelong gallop, resting on the front knuckles, to the nearest tree. There he meets his pursuer, especially if his family is near and requiring his defence. No negro willingly approaches the tree in which the male Gorilla keeps guard, even with a gun. The experienced negro does not make the attack, but reserves his fire in self-defence. The enmity of the Gorilla to the whole negro race, male and female, is uniformly attested. Thus, when young men of the Gaboon tribe make excursions into the forests in quest of ivory, the enemy they most dread to meet is the Gorilla. If they have come unawares too near him with his family, he does not, like the lion, sulkily retreat, but comes rapidly to the attack, swinging down to the lower branches, and clutching at the nearest foe. The hideous aspect of the animal, with his green eyes flashing with rage, is heightened by the skin over the orbits and eyebrows being drawn rapidly backwards and forwards, with the hair erected, producing a horrible and fiendish scowl. If fired at, and not mortally hit, the Gorilla closes at once upon his assailant, and inflicts most dangerous if not deadly wounds, with his sharp and powerful tusks. The commander of a Bristol trader once saw a negro at the Gaboon frightfully mutilated from the bite of a Gorilla, from which he had recovered. Another negro exhibited to the same voyager a gun barrel bent and partly flattened by a wounded Gorilla in its death struggle.

The strength of the Gorilla is such as to make him a match for a lion, whose strength his own nearly rivals. Over the Leopard, invading the lower branches of his dwelling-place, he will gain an easier victory; and the huge canine teeth, with which only the male Gorilla is furnished, doubtless have been given to him for defending his mate and offspring.

As the appearance and some of the movements of the Gorilla are very man-like, some of the natives consider that the souls of men have entered into their bodies, and hence many apologies are made for some of their tricks and reported doings. Moreover, from this belief some of their skulls are made objects of fetish worship, and are marked with broad stripes of red paint, crossed by a white one. These were the stories told to Savage.

On returning to America, Savage investigated the parts of the skeletons he had obtained, and compared them with those of the Chimpanzee. Owen, in England, having received some corresponding specimens, continued the investigation, and all were agreed in deciding that the Gorilla was a species in itself, differing from the Chimpanzee, but sufficiently like it to be connected with it in a genus. The Gorilla was termed *Troglodytes Gorilla*, and the Chimpanzee, which will be noticed in the next chapter, kept its name of *Troglodytes niger*. The word Troglodytes was very ill chosen, and it does not refer in any way to the nature or habits of the animals. It was taken from τρωγλοδύται, the name of an Ethiopian tribe who dwell in holes or caves. The native name is Ngina.

The descriptions of the habits and anatomy of the Gorilla, fragmentary as they were, excited great interest in the minds of many travellers, and especially in that of Du Chaillu, who left America in 1855, determined to explore Gorilla Land, and to obtain some of the great Apes, dead or alive.

He first met with the Gorilla amongst some beautiful scenery, near the Sierra del Crystal, at the head waters of the Ntambounay, a stream which runs into the Muni or Danger River. Close to some rapids down which the torrent was rushing with great velocity amongst huge boulders, and sending its spray up to the tops of the highest trees of the banks, was a deserted village, and amongst its ruins were some broken-down sugar-canes. Here and there the canes had been taken down, and torn up by the roots, and they were lying about in fragments, which had evidently been chewed. He writes:—"I knew that there were fresh tracks of the Gorilla, and joy filled my heart; they (the native hunters) now looked at each other in silence, and muttered, *Nguyla*, which is as much as to say in Nepongwe, *Ngina*, or as we say, Gorilla. We followed these traces, and presently came to the footprints of the so-long desired animal. It was the first time I had ever seen these footprints, and my sensations were indescribable. Here was I now, it seemed, on the point of meeting face to face that monster of whose ferocity, strength, and cunning, the natives had told me so much; an animal scarce known to the civilised

world, and which no white man before had hunted. My heart beat till I feared its loud pulsations would alarm the Gorilla, and my feelings were excited to a painful degree. By the tracks it was easy to know that there must have been several Gorillas in company. We prepared at once to follow them. The women were terrified, poor things, and we left them a good escort of two or three men to take care of them, and reassure them. Then the rest of us looked once more carefully at our guns, for the Gorilla gives you no time to re-load, and woe to him whom he attacks. We were armed to the teeth. My men were remarkably silent, as if they were going on an expedition of more than usual risk; for the male Gorilla is literally king of the African forest. He and the crested lion of Mount Atlas are the two fiercest and strongest beasts of the continent. The lion of South Africa cannot compare with either for strength or courage. I knew that we were about to pit ourselves against an animal which even the leopard of these mountains fears, and which perhaps has driven the lion out of his territory; for the king of beasts so numerous elsewhere in Africa is never met in the land of the Gorilla. We descended a hill, crossed a stream on a fallen log, and presently approached some huge boulders of granite. Alongside of one lay an immense dead tree, and about this we saw many evidences of the very recent presence of the Gorillas. Our approach was very cautious: we were divided into parties. We were to surround the granite block, behind which the animals were supposed to be hiding, and suddenly I was startled by a strange discordant, half-human, devilish cry, and beheld four young Gorillas running toward the deep forests. We fired, but hit nothing. Then we rushed on in pursuit, but they knew the woods better than we. Once I caught a glimpse of one of the animals again, but an intervening tree spoiled my mark, and I did not fire, but ran till we were exhausted, but in vain, and the alert beasts made their escape." As the hunters sat round their fire in the evening, before going to sleep, the adventure of the day was talked over, and of course some very tough yarns and stories were told about the Gorillas, most of which ought to have put this traveller on his guard, and impressed him that the greater part of the ferocity and the lion-like courage of the new animal were derived from the imaginations of a very superstitious and not over-courageous race of men. They were great believers in witchcraft, and they believed that many men whose names they mentioned, and who are dead, had their spirits now dwelling in Gorillas. However, Du Chaillu, a few days afterwards, started on a hunt which had a more satisfactory termination than the last. He and the rest got on the track of an old male, and suddenly as they were creeping along in silence, which made a heavy breath seem loud and distinct, the woods were at once filled with the tremendous barking roar of the Gorilla. Then the underbush swayed rapidly just a-head, and presently before them stood an immense male. He had gone through the jungle on all-fours, but when he saw the party he erected himself and looked them boldly in the face. "It stood about a dozen yards from us, and was a sight I think I never shall forget. Nearly six feet high (he proved four inches shorter), with immense body, huge chest, and great muscular arms, with fiercely glaring large deep gray eyes, and a hellish expression of face, which seemed to me like some nightmare vision; there stood before us the king of the African forest. He was not afraid of us. He stood there and beat his breast with his huge fists till it resounded like an immense bass drum, which is their mode of offering defiance; sometimes giving vent to roar after roar. The roar of the Gorilla is the most singular and awful noise heard in these African woods. It begins with a sharp bark like an angry dog, then glides into a deep bass roll, which literally and closely resembles the roll of distant thunder along the sky, for which I have sometimes been tempted to take it when I did not see the animal. His eyes began to flash fiercely, for we stood motionless on the defensive, and the crest of short hair which stands on his forehead began to twitch rapidly up and down, while his powerful fangs were shown as he again sent forth a tremendous roar. He advanced a few steps, then stopped to utter that hideous roar again; advanced again, and finally stopped when at the distance of about six yards from us, and then, just as he began another of his roars, beating his breast with rage, we fired and killed him. With a groan which had something terribly human in it, and yet was full of brutishness, he fell forward on his face. The body shook convulsively for a few minutes, the limbs moved about in a struggling way, and then all was quiet; death had done its work, and I had leisure to examine the huge body. It proved to be five feet eight inches high, and the muscular development of the arms and breast showed the immense strength it had possessed."

Du Chaillu once had a capital view of some Gorillas at their meal. News having come that

Gorillas had been recently seen in the neighbourhood of a plantation on the Fernandez Vas river, just south of the equator and not far from the West African coast, he got up early and went into it. He writes: "The plantation was a large one, and situated on very broken ground, surrounded by the virgin forest. It was a lovely morning; the sky was almost cloudless, and all around was as still as

A FAMILY OF GORILLAS.

death, except the slight rustling of the tree tops moved by the gentle land breeze. When I reached the place, I had just to pick my way through the maze of tree-stumps and half-burned logs by the side of a field of casada.

"I was going quietly along the borders of this when I heard in the grove of plantation trees towards which I was walking a great crushing noise like the breaking of trees. I immediately hid myself behind a bush, and was soon gratified with the sight of a female Gorilla; but before I had time to notice its movements, a second and third emerged from the masses of colossal foliage; at length, no less than four came in view. They were all busily engaged in tearing down the larger trees.

One of the females had a young one following her. I had an excellent opportunity of watching the movements of the impish-looking band. The shaggy hides, the protuberant abdomens, the hideous features of these strange creatures, whose forms so nearly resemble man, made up a picture like a vision in a morbid dream. In destroying a tree, they first grasped the base of the stem with one of their feet, and then with their powerful arms pulled it down, a matter of not much difficulty with so loosely-formed a stem as that of the plantain. They then set upon the juicy fruit of the tree at the bases of the leaves, and devoured it with great voracity. While eating, they made a kind of chuckling noise, expressive of contentment. Many trees they destroyed, apparently out of pure mischief. Now and then they stood still and looked around. Once or twice they seemed on the point of starting off in haste, but recovered themselves, and continued their work. Gradually they got nearer to the edge of the dark forest, and finally disappeared." On the next day he was carrying a light gun, having given his heavy double-barrelled rifle to a boy to carry, when in a deep hollow, flanked with sugar-cane, he saw on the slope opposite to him a gigantic Gorilla standing erect, and walking directly towards him. Pointing his rifle, he turned to look for the boy, but he had seen the Gorilla and bolted forthwith. The huge beast stared at Du Chaillu for about two minutes, and then without uttering any noise moved off to the shade of the forest, running nimbly on his hands and feet.

This running movement is performed principally by the arms, for the animal places the backs of its knuckles on the ground, straightens its elbows, and swings the huge body and short legs so that they come in front. Then the feet support the weight of the body until the knuckles are put on the ground in advance.

Anxious to possess some adult Gorillas, Du Chaillu offered rewards to the native hunters, and on one occasion they brought in three live ones, one being full-grown. This was a large adult female, who was bound hand and foot, and with it was her female child, screaming terribly, and the third was a vigorous young male, who was also tightly bound. The female had been ingeniously secured by the negroes to a strong stick, the wrists being bound to the upper part, and the ankles to the lower, so that she could not reach to tear the cords with her teeth. It was dark when they were brought in, and the scene was wild and strange in the extreme. "The fiendish countenances of the Calibanish trio, one of them distorted by pain, for the mother Gorilla was severely wounded, were lit up by the ruddy glare of native torches." The young male was secured by a chain, and Du Chaillu gave him the name of Tom. His feet and hands were untied, and he immediately showed his want of gratitude by rushing at his possessor, screaming with all his might; but the chain was happily made fast, and he did no harm. The old mother-Gorilla was in an unfortunate plight. She had an arm broken, and a wound in the chest, besides being dreadfully beaten about the head; she groaned and roared many times during the night, probably from pain. She lived until the next day, her moanings were more frequent in the morning, and they gradually became weaker as her life ebbed out. Her death was like that of a human being, and her child clung to her to the last, and tried to obtain milk from her breast after she was dead. The young one was kept alive for three days on goat's milk, but it died on the fourth day. The young male would not be photographed, for pointing the camera at him made the irascible little thing a small demon, but after some attempts his likeness was taken. These Gorillas were caught on a promontory which runs into the sea like a spit. A woman had seen "two sets of Gorillas on it with young ones, and the natives assembled, and armed themselves with great spears and axes, forming a line across the spit, advancing towards its extremity. They made a good deal of noise, and bewildered the Gorillas, who were shot down or beaten in their endeavours to escape. There were eight females together, but no large male." Du Chaillu, on hearing this, modified his opinion respecting the solitary habit of the animal, and he subsequently obtained proofs that they roam in bands of from five to ten. It is true, however, that when Gorillas become aged, they seem to be more solitary, and live in pairs, or as in the case of old males, quite alone. He was assured by the negroes that solitary and aged Gorillas are sometimes seen almost white, for the hair becomes grizzled with age. Evidently the animal migrates here and there in his restricted district during certain seasons, and they search for a little yellow berry called "rubino," which grows on a tree resembling the African teak; and also two other fruits, one like the nectarine in size, and of the colour of the peach, but not having the rich bloom, and the other like a plum." The same traveller came suddenly on a band of Gorillas in a forest; "a whole group was on a tree hidden by the

dense foliage. They bolted off, making the thinner boughs bend with their weight, and an old male, apparently the guardian of the flock, made a bold stand, and stared at him through an opening. As soon as voices were heard, the shaggy Ape roared a cry of alarm, scrambled to the ground through the entangled lianas that were around the tree trunk, and soon disappeared into the jungle."

Having had, then, so many opportunities of seeing Gorillas alive and dead, Du Chaillu, of course, added largely to the knowledge of their general shape and habits, and obtained skins for stuffing, and bones for the anatomists. Five specimens were sent over by him to England, and great discussions took place; some naturalists asserting that the ferocity and courage of the great Ape were imaginary, and others believing in the truth of Du Chaillu, whose only fault was over-sensational writing, and who strenuously denied many of the native stories. Then the anatomists had a great quarrel about the brain of the creature, and handled each other very severely. Of the nature of the outside of the Gorilla there could be no doubt, fortunately, for there are the stuffed skins and bones to be seen, and an examination of those in the national collection will prove how closely Savage must have questioned the natives who gave him reliable information, and how little can be added to his description. Du Chaillu says that in length the adult Gorillas vary as much as men, and believes that the tallest are six feet two inches in height, but that the average is from five feet two inches to five feet eight inches. The females are smaller, or have a lighter frame, their height averaging about four feet six inches. The colour of the skin in the Gorilla, young as well as adult, is intense black, so far as the face, breast, and palms of the hands are concerned. The fur of a grown, but not aged specimen, is iron-gray, and the individual hairs are ringed with alternate stripes of black and gray. It is long on the arms, and slopes downwards from the shoulder to the elbow, and upwards from the wrist to it. The head is covered with reddish-brown hair, which is short, and reaches the short neck. The chest is bare in the adults, and thinly covered with hair in young males. In the female the breast is bare, and the hair elsewhere is black with a red tinge, but it is not ringed as in the male; moreover, the reddish crown which covers the scalp of the male is not apparent in the female till she has almost become full grown. The eyes are deeply sunken: the immense overhanging long ridge giving the face the expression of a constant savage scowl. The mouth is wide, and the lips are sharply cut, exhibiting no red on the edges, as in the human face. The jaws are of tremendous weight and power. The huge eye-teeth or canines, of the male, which are fully exhibited when, in his rage, he draws back his lips and shows the red colour of the inside of his mouth, lend additional ferocity to his aspect. In the female these teeth are smaller. The almost total absence of neck, which gives the head the appearance of being set into the shoulders, is due to the backward position of the joints which fix the head to the spine, and this allows the chin to hang over the top of the front of the chest. The brain-case is low and compressed, and its lofty top ridge causes the profile of the skull to describe an almost straight line from the back part, or occiput, to the ridge over the brow. The immense development of the muscles, which arise from this ridge, and the corresponding size of the jaw, are evidences of the great strength of the animal. The eyebrows are thin, but not well-defined, and are almost lost in the hair of the scalp. The eyelashes are thin also. The eyes are wide apart; and the ears, which are on a line with them, are smaller than those of man, but very much like his. In a front view of the face the nose is flat, but somewhat prominent—more so than in any other Ape; this is on account of a slightly projecting nose-bone, very unusual in Apes. The chest is of great capacity; the shoulders being exceedingly broad. The abdomen is of immense size, very prominent, and rounded at the sides. The front limbs have a

FACE OF THE GORILLA.

prodigious muscular development, and are very long, extending nearly as low as the knees. The forearm is nearly of uniform size from the wrist to the elbow, and, indeed, the great length of the arms, and the shortness of the legs, form one of the chief differences between it and man. The arms are not long when compared with the trunk, but they are so in comparison with the legs. These are short, and decrease in size from below the knee to the ankle, having no calf. The hands, especially in the male, are of immense size, strong-boned, and thick; the fingers are short and large, the circumference of the middle finger at the first joint being five and a half inches in some Gorillas. The skin on the back of the fingers, near the middle, is callous, and very thick, which shows that the most usual mode of progression of the animal is on all-fours, and resting on the knuckles. The thumb is short, and not half so thick as the forefinger; and the hand is hairy as far as the division of the fingers, which are covered with short thin hairs. The palm of the hand is naked, callous, and intensely black. The nails are black, and shaped like those of man, but are smaller in proportion, and

PALM OF THE FOOT OF YOUNG GORILLA.

BACK OF THE HAND OF YOUNG GORILLA.

(From the *Transactions of the Zoological Society of London.*)

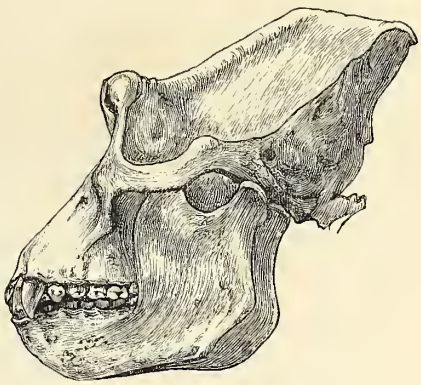
project very slightly beyond the ends of the fingers. They are thick and strong, and always seem much worn. The hand of the Gorilla is almost as wide as it is long, and in this it approaches nearer to those of man than any of the other Apes. The foot is proportionally wider than in man; the sole is callous, and intensely black, and looks somewhat like a giant hand of immense power and grasp. The transverse wrinkles show the frequency and freedom of movement of the two joints of the great toe-thumb, proving that they have a power of grasp. The middle toe, or third, is longer than the second and fourth, and this is unlike the foot in man. The toes are divided into three groups, so to speak; inside the great toe, outside the little toe, and the three others partly united by a web. Du Chaillu thinks that in no other animal is the foot so well adapted for the maintenance of the erect position, and he erroneously believed that the Gorilla is much less of a tree-climber than any other Ape. The foot in the Gorilla is certainly longer than the hand, as in man. These descriptions are fairly correct, but it is necessary to examine the results of the later writers on the subject, from whom we may glean the following facts.

The Gorilla has a large head, and on looking at a stuffed specimen one is at once struck with the width and length of the face, and the great prominent brows immediately over the eyes. There appears to be no forehead, for the head recedes rapidly backwards, and then comes a high ridge of hair, in old males, running from before backwards on the top of the scalp, and meeting

another which is less prominent, and placed across the back of the skull, from the back of one ear to that of the other. The animal has the power of moving the flesh and skin which constitute the scalp freely forwards and backwards, so that when it is in a rage its scowl is made all the more threatening and ugly by its frowning and bringing down the hairy ridge close to above the eyes. The hazel eyes are large, and they are separated by a small prominent bridge belonging to the nose, the rest of which is broad and flattened out. The jaws project forwards, and are long and wide, the teeth being large and strong, and visible when uncovered by the fleshy and rather hairy lips. The ears are small for the size of the head, when they are compared with those of other Apes, and they as well as the skin of the face are naked and dark.

Nature has been kinder to the females so far as beauty is concerned, for they have less marked crests of hair, smaller brows, and shorter side teeth, and therefore more amiable faces under all circumstances.

Of course the outside appearance of the head has much to do with the skull beneath, and this has been very carefully studied by anatomists. As a whole, the skull of a full-grown male Gorilla is larger than that of a man, but it is lighter, although it appears to be more massive on account of its being marked by great bony ridges or crests, which correspond with the lines of hair on the top and back of the head, one being on the top like the crest of a helmet, and the other crossing the back and reaching the other so as to form a rude T shape. Careful measurement proves the great size of the Gorilla's skull as a whole, and that this is dependent mainly on the dimensions of the bones of the face, the cavity for the brain being smaller than that of man. But it does not appear at first very easy to explain how it is that this massive-looking skull should be lighter than that of man. A careful examination of the bones of the Gorilla's skull explains the difficulty, and in a very interesting manner.



SIDE VIEW OF THE SKULL OF GORILLA.

The massive and solid look is given to it by the crests or ridges beneath the hair already mentioned; they are of great use, for they give attachment to very powerful muscles, especially to those which move the lower jaw, and enable the teeth to bite forcibly. The surface of the bones of the head for a certain depth is solid enough, but below this solid layer there is a cellular arrangement consisting of a network of bone, with cavities communicating with each other with the internal parts of the ears and nose. Below this is solid bone again. So that there are three layers, and the central one gives lightness and strength to the whole; moreover, it protects the brain under the skull from receiving shocks during falls or blows by boughs.

When the skull receives a sharp blow, for instance, in front or behind, or low down at the sides, the outer layer of solid bone is often cracked, and even forced in. If there were no cellular layer, the tender brain would be injured directly, but the network of bone and the large spaces amongst it take off the jar from that important organ, and suffer the outer layer to be pressed in without affecting the deeper structures. It must be a very hard blow that can press the cellular layer in sufficiently to break through the third layer, which is solid but thin. Very possibly the larger air spaces of the cellular layer assist the senses of hearing and of smelling also.

There is another very strong bone connected with the skull, which feels like a ridge, passing backward from the eye to the ear; and it has something to do with the other ridges, for the muscles which are attached to them, and which pass down to the lower jaw to give it great power of mastication, are covered on the cheek by it. This cheek-bone forms a kind of arch, and gives the great breadth to the upper part of the face of the animal.

In a front view of the skull of the male Gorilla the ridge or crest on the top of the head stands up like a little peak; then over the eyes is the great brow ridge, which seems to press the upper part of the cavity for the eye (the orbit) flat, so that it is not round as in most animals, but rather square in outline. These three sets of ridges, those of the upper and back part of the brain case, that of the

brow and those of the cheeks, so large and important, are distinctive of the adult male animal, and a skull possessing them belongs to the Gorilla and to no other animal.

The females and the young of both sexes have not the top ridges, and the others are small in comparison with those of the male adults.

Clearly the ridges give strength to the head, muscular power to the jaws, and what is of great importance to a large active animal, do not interfere with the lightness of the strong skull.

The skull is hollow beneath the top and back ridges, and this space is occupied by the brain and its investing membranes, and the nerves coming from it, to supply the muscles of the face and head, the skin over them, and the organs of special sense, such as the eye, the ear, and the nose. The space is considerable, and for an Ape the Gorilla has a large brain. He has a large body, very many muscles capable of complicated movement, and he can see, hear, and smell admirably; and as the nerves which supply the necessary energy for all this come from the great nervous centre, as the brain is called, it must be of considerable size and complexity. Moreover, as many of the motions and sensations of the Ape resemble those of man, the brains of both will resemble each other to a certain extent. But all that part of the brain which serves in a manner, as yet past our comprehension, to assist the production of the high intelligence and moral powers of man, we should expect not to find in the purely sensual animal, and the expectation is realised. Again, although bone for bone, muscle for muscle, and blood-vessel for blood-vessel, those of the great Ape and man may be compared with wonderful exactitude; still man in relation to the Gorilla has a greater power of elegance of movement, and of producing complicated muscular efforts, and of employing many different muscles to produce a common end, and therefore his nervous system must be all the more perfect. Thus, the Ape cannot imitate the graceful actions which sway the body as when a well-made man walks leisurely, and it cannot get all the muscles of the mouth, tongue, and larynx (or organ of voice) to act simultaneously and orderly, so as to produce the sound of articulate voice. Yet these actions are performed by man without any special effort; they may be done without thinking, and are mechanical, as it were, or more properly, "automatic," done as if by a machine; they require a very perfect arrangement of the nervous system, and an unusual amount of nervous matter.

No amount of schooling, could it be given, would ever make a Gorilla entertain the notion of insuring its life; arithmetic is impossible; the fine arts and poetry are unattainable, and therefore by so much is its brain the smaller and simpler.

The brain case, or the space enclosed by the crested skull bones, is compactly filled with the nervous material in all animals, so it is only necessary to ascertain the relative dimensions of the spaces in different animals to get a notion of the difference in the sizes of their brains. The space can be measured by filling it with sand, and then measuring its bulk in a proper measure.

Some Gorillas have larger spaces for the brain than others, and in this they resemble man, for there is a considerable difference between the capacity or the size of the space in a well-educated European and a savage Australian. And, doubtless, some Gorillas are cleverer than others, or are more active, generally speaking, so have larger brains; but an average may be taken of the different sizes in them as in man, and the results come out as follows:—

The average or mean size or capacity of the brain case in the Gorilla is about 31 cubic inches, a cubic inch being a six-sided space of one inch long, broad, and high. In man, the European may have a brain case holding 114 cubic inches, and the Australian only 63 cubic inches; the mean of the European size is 93 cubic inches, that of the Australian being 75. Hence the brain case, and therefore the mass of the substance of the brain of the Gorilla, is not one-half that of the lowest race of man.

Only the brains of young Gorillas have been examined, and these have not been in a very satisfactory state; but enough has been gleaned from their study to determine that they are not so high, wide, or long, relatively, as those of mankind. The brain of man is a wonderfully complex structure, and the nervous matter is folded and packed in many ways or "convolutions," and the nerves arise from special parts which are connected by cross and long fibres or "commissures." All these structures exist, but not in perfection, in the Gorilla's brain; and although the nerves are large, that portion of the brain which originates their energy and action is much smaller than in man.

Apparently the brain grows to a certain age in the Gorilla, and then the skull increases in outward size, and the creature has a huge body, with mental capacities far below those of a child of man.

The ridges and crests on the top and back of the Gorilla's skull are larger than those of any of the great flesh-eating animals of the cat tribe, and it has therefore been thought that they were a proof of the occasional bad habits of the great Ape, and of his indulging now and then in negro flesh. Large as are the crests in the old males, they are barely present in the females and young, and they must be regarded partly as of use to the larger animals, and partly as ornamental; for in animal nature, as a rule, the gentlemen are more beautiful than the ladies, the idea of beauty being, of course, very much a matter of taste. They are evidently protections against falls, and they also give origin to muscles. The back crest, when looked at from behind, is almost fan-shaped, the bone being broad, and the great muscles of the neck and back are attached to it. They pull the head backwards, and the single, long crest on the top gives origin to the muscles, which pass downwards on the temples to the lower jaw. Indeed, the energy of the muscles of the side of the head is principally devoted to the lower jaw, to its crushing, crunching, and masticating offices, for the food, although often soft enough, is occasionally inside the sugar-cane, and several harder woods. The powerful upper jaw is, of course, attached to an equally strong lower one, which forms the front and lower part of the face. The upper jaw reaches out far in front of the eyes and nostrils, and is straight rather than bulged, and appears narrow, from side to side, in comparison with the great, wide cheek-bones, but it looks formidable with four strong front teeth, projecting only slightly, and a large, long, eye tooth on each side, sticking out rather far below the others.

On looking at the under surface of the roof of the mouth and palate, the cause of the length of the front of the face is seen. Instead of the back teeth forming an open curve around the roof of the mouth, as in men, they are placed in a long, and almost parallel straight row. Five great teeth on each side thus form with the bone, into which their fangs are planted, a long side to the face. In front of these is the large eye, or dog tooth (canine tooth), mentioned above.

The palate and roof of the mouth are long and comparatively narrow, and hence no Gorilla could speak distinctly, or use his tongue glibly enough to talk as a child. Howling and a kind of bark may, on the contrary, be done to perfection.

But although of no use as regards speech, the long roof of the mouth, with its wide ranges of teeth, is of great importance to a vegetable-eating creature, which does not want the sugary juices of its food to run out of the corners of its mouth, and which spends the greater part of its time in filling its capacious stomach. * The lower jaw fits the upper one, and when its teeth clench with those above, the cavity of the mouth is nearly shut, and it is quite closed by the lips and cheeks outside.

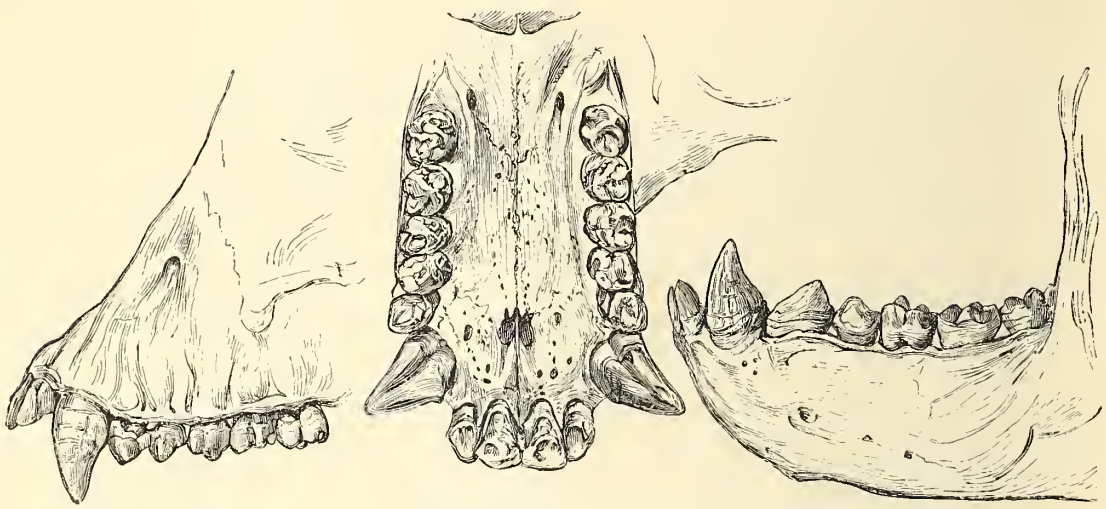
As might be expected from the great muscles which unite the lower jaw to the skull, it is large and strong, but it has no projecting chin, and this slopes in a retiring manner. The side of the jaw which supports the teeth is, as in man, curved upwards behind at what is called the angle. The jaw is very movable, and can act sideways in munching, or up and down, as in biting; and having these powers—thanks to the action of different sets of muscles—it has teeth fashioned to bite, and to crunch, and to chew. They greatly resemble those of the upper jaw, on which they work, and a superficial view of them all leads to the opinion that they greatly resemble those of man; there are, however, many differences. As in the upper jaw, the front and eye teeth are nearly straight in front, the last-mentioned projecting outwards, and the front teeth biting inside the upper ones; and the back teeth are in straight rows also.

The following story is told by Du Chaillu to illustrate the cause of the wearing of the front teeth of the Gorillas. He had gone into the interior, and was suffering from hunger, so went out into the forest for game. Not finding any, he was about to retrace his steps, when he heard the unmistakable roar of a Gorilla. He writes, "I plunged forward into the thick of the forest, breaking, as I went along, small boughs to enable me to find my way back, and tearing my clothes in the thorny underwood. The roar became nearer, and seemed to shake the ground under me. I heard the rustling of the branches, and fancied there must be more than one. The excitement of the moment was great, and was increased by the prospect of obtaining food for all our party.

* The back edge of the hard, bony palate, with which the soft palate and uvula are continuous, forms a wide concave notch, whilst that of man projects in the centre of the notch.

Suddenly the roaring ceased. I stopped, thinking that it was a male, which was preparing to advance on me. But I listened in vain—the beast had fled. When I reached the spot I saw nothing but broken branches of trees. I measured some of them with my thumb, and found boughs of five inches diameter broken in two by the powerful grip of this monster of the forest. Although disappointed in my chase, I was glad to find a corroboration of the explanation I had given of the wearing down of the animals' front teeth, for some of the branches plainly bore the tooth-marks."

As the teeth of the Gorilla are admirably adapted for their duties of masticating and biting vegetable food, sometimes soft and sometimes hard, and as they resemble in number and general arrangement those of man, it is necessary to notice them briefly. They are of three kinds, the front ones, which bite when the jaw is moved up and down, the large eye teeth (or dog teeth), which pierce, and the back teeth, which crush and grind. The first-mentioned are called incisor teeth or cutters, and there are four in the upper and four in the lower jaw, as in man; the inner two in each jaw being



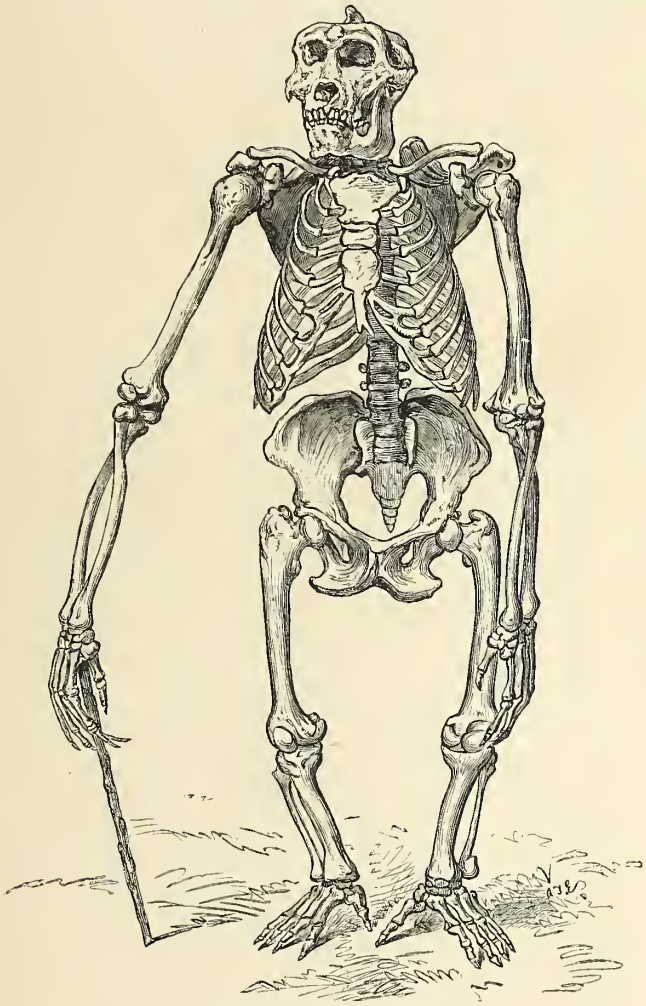
UPPER JAW. PALATE. UNDER JAW.

THE TEETH OF THE GORILLA.

larger than the outer two. They project slightly, and those of the upper jaw cut on the lower ones, and are, when the jaws are clenched, in front or "over-hung." In shape they are adapted for biting a piece out of anything, and they have one fang each, which fits into a socket in the jaw. In the upper jaw there is a space between the incisor teeth and the great eye or dog teeth. This is one of the matters which distinguish the jaw of the Gorilla from that of man, whose teeth are continued in a row without any spaces where the gum is visible between them. The cause of the space is that the lower eye tooth is so large and long that when the mouth is closed it fits in there. This space is called a "diastema," and, as it is a term which will often be mentioned, it is necessary to notice that it is taken from the Greek word διάστημα, "an interval." In the lower jaw the incisor teeth are succeeded by the eye teeth without any diastema. The eye or dog teeth are usually called canines, from *Canis*, a dog, they being very distinct in that animal. They are four in number, two being in each jaw, one on either side, and those of the upper jaw are long and pointed, being rounded, moreover, outside, and marked by grooves inside. The lower canines are nearly as large as the upper ones, and, as already noticed, fit in the diastema in front of those of the upper jaw.

Behind the canine teeth are, on each side in both jaws, five crushing teeth, that is to say, ten in each jaw, and twenty in all. In the upper jaw there is a continuous row of teeth from the canines in front to the last of the crushers, which occupy the position of the upper wisdom teeth of man, but in the lower jaw there is not this serried row of teeth, for, between the crushing ones and the canine, there is another space or diastema into which the upper canine tooth fits when the mouth is closed.

All these hind teeth are made to endure constant grinding, one over the other, in masticating, frequent sudden shocks, when nuts are cracked, for instance, and to last for years. Covered with a beautiful enamel, which gives them strength and smoothness, they are safely fixed by fangs in sockets in the bone, in such a manner that the nerves and blood-vessels supplying them do not suffer from pressure. They are not quite flat at the top, for then they could not grind, and they are not acutely sharp-pointed, for then the points would prevent the side-to-side movement of the jaw, and would be broken off; but they have rounded projections, or cusps, on them, separated by grooves, so that those of



SKELETON OF THE GORILLA.

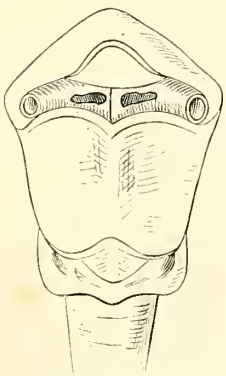
the teeth of one jaw can fit into those of the other. All these teeth are not quite alike, and they are divisible into two kinds, the three hinder ones being the molar teeth, from *Mola*, a small clove, and the two in front of them being called false molars or pre-molars (front molars). Every one who has had a back tooth (a molar) taken out, will remember its three fangs, and in a Gorilla there would be the same terrible wrench in extracting a molar for the same reasons as with us. But, fortunately for it, tooth decay is unknown, and the molars, with their three fangs, last as long as life. The pre-molars have two fangs only in man, but it appears that sometimes there are three to those teeth in the upper jaw of the Gorilla, and two only in the lower. They are smaller than the true molars or three back teeth, and the front of them; and that nearest the canine tooth is often tall, and almost like a four-sided

pyramid in shape. The size of the crushing or molar teeth is very distinctive of the Gorilla when it is compared with the other great man-like Apes, for the upper ones are equal in size, and in the lower jaw the hindmost tooth is larger than the others. Moreover, these lower teeth have five cusps or projections. There is a ridge extending obliquely across the crowns of the lower molars from an inner to an outer cusp; and the cross-like grooves of the upper surface of the corresponding teeth in man are not seen. The manner in which the teeth of the Gorilla differ from those of other Apes will be mentioned in the several descriptions. Milk teeth, or those of the first set, are found in baby and young Gorillas, and when they fall out the permanent set come out of the jaw and replace them, adding also to their numbers. The long canine teeth are characteristic of the old males, and those of the females and young are much smaller. The thirty-two teeth of the Gorilla, eminently adapted for a mixed vegetable diet, are therefore arranged as follows:—Upper jaw—four incisors, two canines, four pre-molars, and six true molars, and there is the same number in the lower jaw.

It is a very remarkable fact, and one which will be of some interest in comparing one of the other great Apes with the Gorilla, that the skull of the young Gorilla (of both sexes) and that of the full-grown female differs materially from that of the male in the absence of the prominent ridges of the top and back of the head. This gives a roundness to their skulls which would at first sight lead to the belief that they could not belong to the same species.

Living upon such nice things as sugar-canes and pine-apples, the Gorilla has a long and well-formed tongue to taste them with,* and a good nose to enjoy their scent and fragrance. The nostrils are open, and look downwards, being separated by a moderately wide piece of flesh covering, gristle, or cartilage, and they are protected above by very dense bones, which form the slight ridges called the nasal bones. Up the nose a passage leads to the air spaces in the bone of the front of the head, and they and some curiously curled bones not very far from the nostrils are covered with a delicate membrane well supplied with the nerves in which the function of smell exists.

Both the natives and Du Chaillu allude to the roaring and yelling of the old male Gorillas, and it will be noticed further on that the young ones can make noise enough. Dr. Savage was told that when the male is first seen he gives a terrific yell that resounds far and near through the forest, something like *Kh—ah! Kh—ah*, prolonged and shrill, and others have compared the noise to distant thunder. They have an organ of voice on the top of the windpipe, made on the plan of that of man, but deficient in many respects, and especially in those fine adaptations of structure which produce the human voice. But there is a very remarkable arrangement in their larynx, as it is called, which, although it has nothing to do with the formation of sound, may possibly make it more resonant and growling, and this is one of the things which separate the great Ape from man in matters of mere construction.



THROAT OF GORILLA.

At the back of our tongues, and also of those of the Gorilla, is a little flap, rather hard and gristly in us, and only membranous and soft in the Ape, which covers over the top of the air-passage into the windpipe when any food is swallowed. The food or drink would otherwise get into the air-passage, and would be constantly going "the wrong way." Immediately under this flap, or, as it is called, the epiglottis, is a space limited in front by the hard substance we call in our throat the "Adam's apple," and at the bottom of it are the movable structures by whose action voice is produced. Now, in the Gorilla, this space is not shut in front as it is in us, but there are two openings in it, one on either side, which lead to a complicated sac or pouch. This pouch is made of thin membrane, and covers, when blown out like a bag—for the air coming out of the windpipe can be forced in—the front of the windpipe, and projects sideways under the muscles of the throat, and even amidst those of the armpits. The Gorilla can thus blow his neck out, as it were, and when he is yelling, the air in the bag

* The tongue has the same kind of papillæ, or slight projections of its surface, as man; some called fungiform are seen at the tip, and on the surface generally, and others more or less cup-shaped. These last are found at the back, and are not arranged in any definite shape or order.

or pouch must resound. Possibly this great bag of air may have something to do with making the body lighter when the animal is climbing and using all the force it can with its arms. These so-called "laryngeal" pouches are found in many Apes and Monkeys, but their double opening into the space below the little flap is peculiar to the great Apes, which are sufficiently man-like as to be called by the term Anthropoid—the Gorillas, their allies the Chimpanzees, the Orangs, and the Siamangs.* All the other Monkeys of the Old World with sacs have but one opening into a space, or, as it is termed, the ventricle of the organ of voice, or laryux. The Monkeys of the New World have a different arrangement of air pouches, which will be noticed in the proper place.

The Gorilla has one little peculiarity which distinguishes it from all other Apes and Monkeys, and which causes it to be more like man, and insignificant as it may seem, it is of some interest. In man there is a decided projection of bone behind, or rather below the ear, and this is called the teat-shaped process of the ear-bone (Mastoid process), and is of importance to the organ of hearing and also to the muscles which steady and keep the head erect, and allow of its being moved in particular directions. This process exists to a certain extent in the Gorilla but not in the Chimpanzee, Orang Outan, or in any other of the Quadrumana. It is smaller in the Gorilla than in man, but it is made up, as in us, of a number of spaces enclosed by bones which have to do with the organ of hearing in some way or other, and which are lined with membrane. On the outside a muscle is attached, which passes downwards and inwards to the top of the breast-bone, covering the great blood-vessels and nerves of the neck.

In examining this process of bone, attention is of course drawn to the ear itself, and there is no doubt of the remarkable resemblance of those of man and of the Gorilla. The great Ape has evidently a very quick sense of hearing, for it gets out of the way of men as quickly as is possible, when it can only hear them in the forest and jungle, but that it should have the outside ear fashioned nearly after the resemblance of that beautiful structure in man is very remarkable. The ear of the Gorilla is smaller in proportion to the size of the head than those of other Apes, and is about the same length, but broader than that of man; the lobe, which is perforated by us for earrings, is perhaps less perfect in the Gorilla, but all the curves and folds, which are so complicated yet so graceful in the human ear exist in it, modified more or less, and not so harmonious in their general symmetry, as in man.

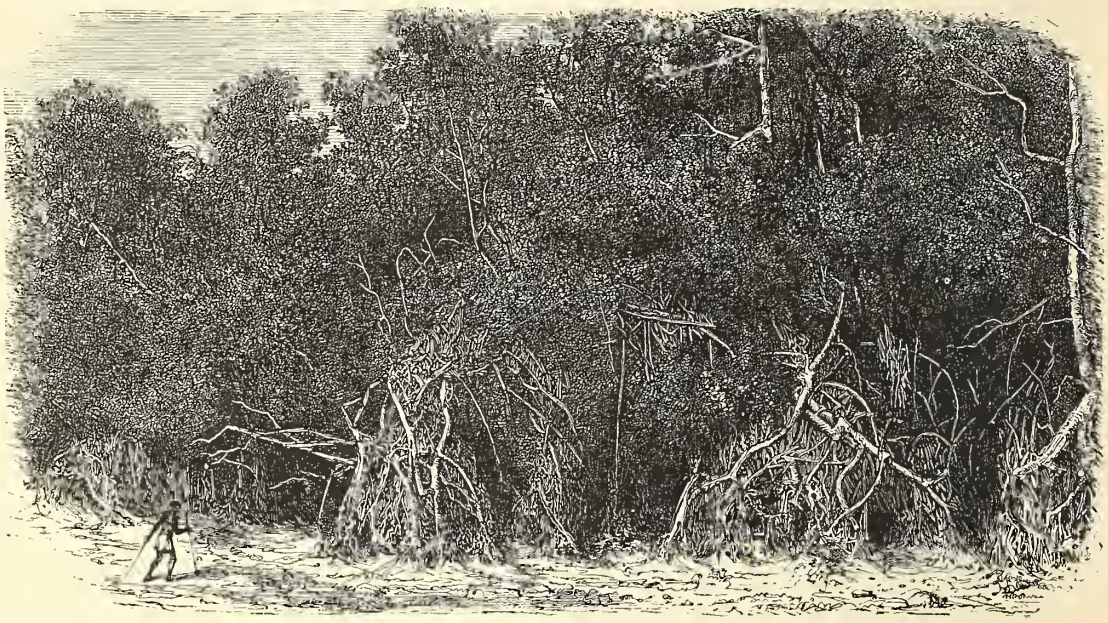
With all its great strength, the head of the great Ape cannot move as readily on the neck as that of weaker man, for the skull is not placed on the neck end of the back-bone quite in the same manner, and its position is not that which is admirably (as in us) adapted for carrying the head erect. One of the greatest marvels in the structure of man is the manner in which the tender mass of nerves called the spinal cord or marrow passes out of the hard skull into a bony canal down the spine, and yet does not suffer injury as head and back move and roll about.

The spinal cord or marrow passes out of the skull through a special opening, on the outside of which is a joint on either side. These joints fit on to corresponding ones on a ring-shaped bone (atlas bone), and this bone rests on one equally hollow, and which has an upward projection which enters the ring (axis bone), and is clasped to it by a strong ligament. It is this projection which prevents the spinal marrow from being injured by the head moving too freely, and yet life hangs almost on a thread, for were this strong ligament to break the soft nerve would be pressed in by the bony projection, and death would ensue. All the motions of the head are connected with these bones and their joints, and the way in which it is carried is in relation with the position of the opening in the skull for the spinal marrow. If the head is to be carried erect, as in a man and in many birds, the opening is far from the back part of the head. If the face is to look upwards, as it does in a pig or dog, the opening is very far backwards. In the Gorilla it is not quite at the back, but further in that direction than in man, and hence the face of this Ape is more liable to be looking upwards than forwards. This is really the case, for the natural position of the animal is not erect, but on all-fours, and then it wants to look, not on the ground, but upwards and forwards, by tilting the head. Many of the great muscles of the back crest have to do with this. It is noticed also that the joint which permits the head to move on the ring-shaped bone (the atlas bone) is not so long or curved as in man, and therefore the movements of the Gorilla's head are restricted.

* The Gibbons have no air sacs.

All accounts of the life of a Gorilla tell of its moving rapidly amongst trees, climbing readily and noiselessly, and gathering its food constantly. It is therefore necessary to examine into the manner in which this is done, and how it relates to the shape and anatomy of the creature.

In climbing trees, the Gorilla, like a man under the same circumstances, lifts up the arms over the head, and clasps or holds on with one hand, but the position of the hand is not the same. Apes seize instinctively with the knuckles towards them, and not with the ends of the fingers and palm as man: and this makes a great difference, for the muscles of the back are therefore more important to the Ape than those of the chest in climbing. Then with some muscular effort the body is lifted or rather drawn up, so that the unemployed hand can reach and clasp higher than the other; and having thus two hands holding on to a bough or a tree, the muscles of both arms are used to draw up the ponderous trunk, head, and limbs until the face comes more or less on a level with the wrists. When this is accomplished, one of the arms is suddenly forced upwards to enable the huge grasp of the fingers to tighten upon a higher fixed point, and the "hand-over-hand" process is continued as long as is



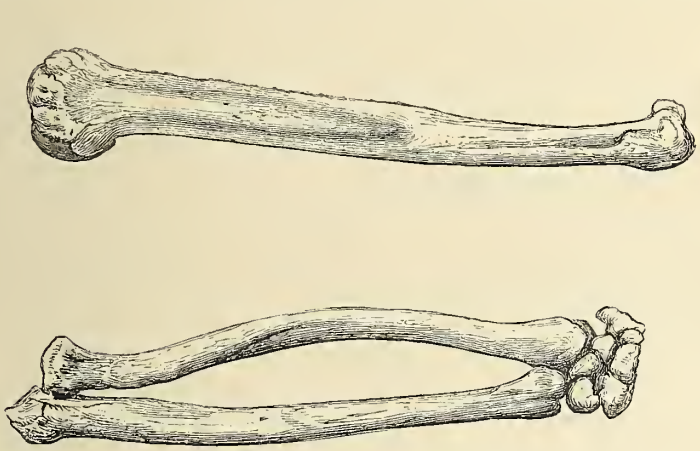
FOREST IN THE GABOON COUNTRY—THE LAND OF THE GORILLA.

necessary. Doubtless the clasping feet assist in this movement, which is only rarely performed by man, but which is one of the commonest with the great Ape. A sailor or an acrobat may often use the muscles which are required to perform this feat of carrying upwards the body with the aid of the arms, but ordinary people rarely employ their energies in this manner; the Gorilla, on the contrary, must climb often and for some distance every day of its life, both for food, amusement, and for shelter. It becomes, therefore, an interesting question whether the Gorilla has any special muscles or bones which enable it to climb easily and rapidly, and for a considerable time, or whether there are the same kinds of bones and muscles in its hands, arms, and shoulders, which are to be found in man modified more or less. The results of careful inspection have proved that, although there are no peculiar structures given to the great Ape wherewith it may climb, still the bones of the arms and shoulders, and the muscles which are attached to them, greatly as they resemble those of man, are larger and stronger. Bone for bone, and almost muscle for muscle, the climbing limbs of the man and the Gorilla may be compared with extraordinary exactness; the structures of the last-mentioned being, as it were, simple exaggerations of the former, and the increased size bearing a distinct relation to the agility and energy displayed. It must be remembered, however, that whilst in man the muscles of the chest assist principally in climbing, in the Ape those of the back and shoulders are the most important.

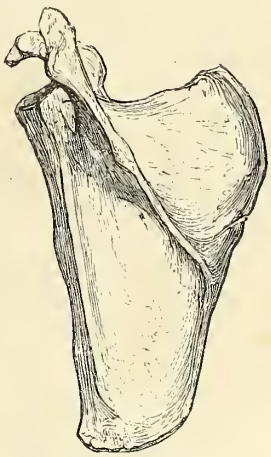
It is hardly necessary to notice the relation which bones and muscles have to movement, and the

most unlearned in anatomy need only be reminded that muscles are adherent to certain parts of bones. The bone, by itself, is motionless, and the force which can move it, and with it, the surrounding flesh and skin, acts through the muscles, and these consist of vast numbers of long microscopic fibrils, placed side by side, and adherent, at both ends, to different bones. The fibrils have a vast amount of energy in them, and they can contract, or, in other words, shorten; the diminution in length being accompanied by a display of force. As the fibrils shorten, they tend to bring the motionless bones closer together, and to impart motion, which may be rapid, and more or less forcible. If one bone is stationary, the other may be brought towards it by the muscular contraction, or if both are not fixed, both may move. The nervous force produces the muscular contraction, whose vigour and lasting power depend a great deal upon the supply of blood sent to the fibrils through the blood vessels (arteries), and removed through the veins.

In the principal act of climbing hand-over-hand, a bough or some stationary object is grasped by the fingers, the arm being straight, and the body hanging, as it were, to it. The first motion is the lifting up of the arm; the second is the grasping with the hand; and the third is the bending of the straight elbow, and bringing the shoulder up nearer the fixed point, or the part grasped. Whilst



BONES OF THE FORE-ARM AND ARM OF THE GORILLA—SIDE VIEW.



SHOULDER OR BLADE-BONE.

this is being done the body is not limp, but more or less stiffened by the spine, which runs down the back, and consists of many bones, being made rigid by the contraction of many small muscles. Now the bones and muscles of all the parts of the body engaged in climbing are so arranged that the spine shall not suffer any jarring, but shall be lifted up safely. Were all the muscles which pull upon the arms attached to it, every unusual effort would drag it almost to pieces, so there is a wide flat bone placed between the spine and the arm. This so-called blade-bone is jointed by a ball and socket joint to the arm-bone, but is only united to the spine and back part of the head by muscles. Muscles start from the spine to the blade-bone, from the blade-bone to the bones of the arm and fore-arm, and from these last to the bones of the fingers, and by their shortening or contraction, the fingers being stationary, the body is at last brought closer to them.

In order to explain the first motions of climbing, it is necessary to remark that on looking at the skeleton of the Gorilla the shoulder-blades are seen to be of the same general shape as those of man; they are much larger, however, and there are some anatomical points about them, which clearly have to do with the ability of the great Ape to keep its arms up for a long time, and to pull up its heavy body when the hands and fore-arms are fixed and immovable by clasping. One muscle, which in ourselves forms the cushion on the shoulder, and reaches down the outside of the arm for a little distance, is called the deltoid or Δ shaped muscle, and its especial duty is, when the shoulder-blade is fixed, to lift up the arm by its contraction. The movement is permitted because between the spots where the muscles are adherent to the blade-bone on the one hand, and to the outside of the arm-bone on the other, a distance of several inches, there is a joint like a ball and socket. The muscle is not

attached to a flat surface on the blade-bone, but to a raised edge, which runs rather obliquely, and is called the spine of the bone. Now this muscle is of immense importance to the Gorilla, as may be imagined from the nature of its function or office: it is placed in the same position as in man, and between the same kind of bones, but the spine of the blade-bone is longer, broader, and more slantingly set in the Ape, so that extra strength and greater power are attained.

This spine, or rather raised ridge, can be felt when we place the right hand over the left shoulder as far as possible, keeping the fingers between the neck and the end of the shoulder, and its slanting position can be traced best in the Gorilla; and it may be mentioned, that in the Chimpanzee the direction is much more oblique. Above this spine of the blade-bone there is the upper part of the blade, and it is covered with muscle, the space thus occupied being much larger in the Gorilla than in man. This muscle starts from this bone, to which it is attached, and is united to the arm-bone, close to its joint with the blade-bone; it is larger in the Gorilla than in us, and one of its uses is to assist the deltoid just mentioned.

There is rather an interesting arrangement in the old Gorillas, which is not found in the young or in man, and which appears to have to do with the power of this muscle and its prolonged action. The muscle is well supplied with blood, and the nerve which endows it with energy is particularly well prevented from being compressed during the movements of the muscles amongst which it runs, any compression being very injurious. The upper edge of the blade-bone is notched, and a dense tissue or ligament stretches from one point of the notch to the opposite one, enclosing a small open space; now the nerve runs through this space, and is protected by the hard tissues of bone and ligament from the contraction of the soft muscles. In the old Gorilla a further protection is found in the presence of a little projection of bone in this space, which acts as a greater preventor of pressure.

After passing through this space the nerve enters the very substance of the muscle, and is distributed to its fibrils.

The upper arm reaches down from the shoulder to the hips in the Gorilla, and its bone (*os humerus*, from the Latin) is strongly marked on its surface by roughnesses and ridges, to which the great muscles are attached. In man the shape of the upper arm varies with the strength of the individual, but in the strongest man and in the most beautifully shaped woman it has a swelling on the front, and tapers more or less towards the elbow. This is caused by the two-headed or biceps muscle, and by other muscles ending in tendons. But the Gorilla has a very shapeless upper arm; it is as it were fat and round throughout, and very large above the elbow, and this is because of the size of the bone within, and on account of the muscles not tapering as they do in man, but being well developed right down to their ends. Hence, elegance of shape is sacrificed to extra muscular strength and size of bone.

On looking at the arm-bone, which, being connected to the shoulder by a joint, has much to do with the act of climbing and striking, it will be noticed that it greatly resembles that of man in shape, but is longer, stouter, and clumsier. The joint is nearly in the shape of a rounded knob, and the corresponding depression or cup on the blade or shoulder-bone into which it fits, is an oval and concave surface, and they are kept close together by a kind of capsule which stretches from one bone to the other and encloses the joint. Perfect freedom of movement is insured by the bones being covered with glistening cartilages, and a delicate and moist membrane, and the motion from the shape of the apparatus is almost equal to that of a chandelier where there is what is called a cup-and-ball joint at the ceiling. It has already been noticed that muscles are attached to the blade-bone and to the arm-bone below the joint, and that, this being movable, when they contract they move the arm, and the instance was given of the action of the deltoid muscle in raising the arm. In the Gorilla, this great muscle reaches lower down than in man, and there is a very strong mark in the shaft of the bone for its insertion. This gives the muscle greater play than in us, and enables it to lift, more slowly perhaps, but more efficiently, for the arm-bone between the joint and the place where the muscle is attached, is the long arm of a lever which is shorter in man. Below the globular head of the arm-bone is the shaft or cylindrical part of the bone which gives origin to the three-headed muscle called triceps, and is covered by the two-headed one (biceps) already mentioned, besides the deltoid. A deep groove allows one of the ends or heads of the biceps to pass along and slide over the joint and to reach the shoulder-blade. The shaft as a whole is more or less cylindrical, with a slight angular outline, the angles being projections of

bone which strengthen the whole, besides giving attachment to muscles; the cylindrical shape is the best for strength and lightness, and these properties are increased by the adoption of a plan which engineers have long since unwittingly copied. The shaft is hollow, and is cellular at both ends, solid bone covering the outside, conditions which oppose fracture, and produce increased strength, indeed greater strength and lightness than a solid bone would have. Below the shaft is an expansion, on which are placed the surfaces for the jointing on of the two bones of the fore-arm, and the bone is especially in old Gorillas perforated there, a condition seen in some very old human bones. There is an important point in the relative length of the upper arm-bone, and the bones of the fore-arm in the Gorilla, in other Apes, and in man, for in this great Ape and in us the humerus is longer than the others, and in the Chimpanzee they are almost equal, whilst in the rest of the Monkeys they are very unequal, the bones of the fore-arm being much the longest.

Although they have such strong arms, covered with a stout skin and with hairs sloping downwards, the Gorillas sometimes manage to break them, and then Nature endeavours to repair the injury. In the skeleton of the old male Gorilla in the British Museum there are proofs of a former fracture of the humerus or upper arm-bone. The arm was broken across, and as it could not be kept quiet, Dame Nature has not done her work as well as a modern surgeon could on a patient whose arm he could put in splints, for it is thickened, shortened, and twisted.

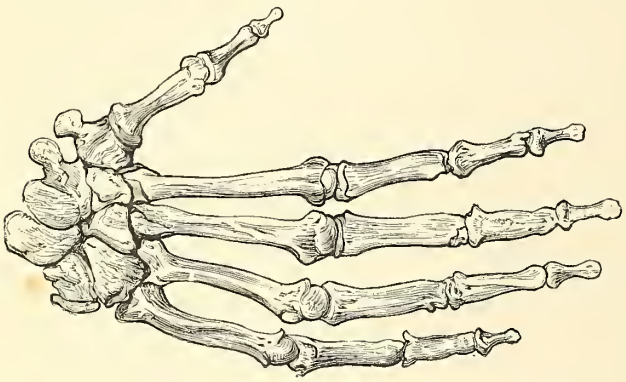
The fore-arm of the Gorilla has its long hairs pointing upwards to the elbow, and the limb does not slope gracefully towards, and become slightly smaller above the wrist, as in man, but remains thick and fleshy as far as the hand. There are two bones in the forearm which are jointed above with the lower end of the arm-bone (humerus), and which are also connected by joints at their lower ends with the small bones forming part of the wrist. The bones of the fore-arm are called the radius and the ulna in the Gorilla as in man. They are larger, stouter, and wider apart in the great Ape than in ordinary Europeans, but they greatly resemble those of the Australian aborigines. As these bones are covered with muscles, some going to the fingers, and others coming from the upper arm, there are many ridges or surfaces on them, for their origin and attachment, and these greatly resemble those of man; moreover, the muscles perform the same functions and movements.

When compared with that of a strong man, the wrist of the Gorilla is broader, and the bones, of the same number, are larger from side to side, and this extra breadth makes this part of the hand very wide. As the Gorilla's hand often has to support the weight of the body, on the back of the fingers and knuckles, it is long, broad, and very strong, surpassing in these respects those of man; but the thumb is peculiar. It does not look a well-formed one; it is evidently short, and out of proportion to the long fingers. The human thumb reaches not far from the second joint of the forefinger; but the top of that of the Gorilla is on a level with the first joint, or at end of the long bones of the hand, and which are called metacarpal bones.

Remarkable then for its breadth and thickness, the Gorilla's hand has also a long palm, which is not only due to the length of the bones, just mentioned, but also to the fact that the web or undivided skin between the fingers, where they join the hand, is not slight as in man, but long and very decidedly visible. The web extends half way up the first joint of the fingers. The fingers are therefore made to appear short* (although their bones are long), and they look dumpy and swollen, and this appearance is increased by there being callous pads of skin on the back of the middle and end joints. Finally, the fingers slope to the nails, which are not much larger or longer than those of man. The back of the hand is hairy as far as the divisions of the fingers; and the callous pads, just noticed, almost do away with the appearance of some of the joints. The short thumb, not so big as the forefinger, has a nail which does not reach the end of it, and the under-parts of the thumb, fingers, and palm have a bare skin. Professor Owen, in summing up the difference between the structure of the hands of the Gorilla and of man, remarks that in the great Ape the hands are instruments for great power of grasp, and for sustaining great weight, and the length and strength of the whole upper limb accord with their mechanical powers and requirements. In man, the framework of the hand bespeaks an organ of varied and delicate prehension, and the form and proportion of the rest of the arm-limb relate to the free motions and complex functions of the instrument.

* See page 16.

Having raised the arm by its muscles, the fingers and thumbs grasp an object, or, in other words, certain muscles which are placed between the bones of the fingers and between the fingers and the bones of the fore-arm, contract and move the bones, which are jointed. The tops of the fingers are bent on the palm, and the thumb is closed on them, and this continues as long as the contraction permits. All the apparatus for long-continued clasping is present in the Gorilla, and there are nearly the same kinds of muscles employed as in man. There are, however, some differences, to one of which it is necessary now to allude. The thumb, for instance, of the Gorilla is of great importance in grasping, but it has not to perform such complicated movements in other things as that of man. In man its movements are most wonderful, and by using one muscle after the other which belongs to it, it can be moved so as to describe a circle with its tip. This is done in the action of "twiddling," but also in many others where the will hardly influences the muscle, and where the thumb may be said to be moved unconsciously. Gorillas in their quietest and most reflective moods cannot indulge in the sober practice of twiddling, for an important twiddling muscle is absent in them. But it is no great loss, and perhaps it is a real gain, for this muscle would be in the way of rapid clasping, as it rather tends to keep the thumb from the fingers. Whilst the great Ape is thus deficient it has a muscle on the other side of the hand which is not possessed by man, and whose office appears to be to separate as far as is possible the fourth and fifth fingers (their first joints), and by so doing to enlarge the grasp of the whole hand. As the hand of the Gorilla is at least a third larger than that of the averaged-sized man, there is of course a corresponding increase in the space which can be grasped. The muscles are stronger and stouter than in us, and therefore the hand is a more powerful one. Nevertheless it is incompetent of performing many actions which are readily done by a child.



HAND BONES OF THE GORILLA.

Having lifted up the arm in the act of climbing, and having grasped something, the third motion commences, the object being to draw up the body to the wrist and fingers, which of course remain as fixed points. All the muscles which intervene between the fore-arm bones and the spines of the back have to contract and shorten, so as to bring the last-named bones towards the fixed point, and they may be divided into *three* groups—those which reach from the arm-bones to the blade-bone, those which connect the blade-bone and the back-bone, and those which unite the arm and the back-bone. All contract at once and shorten the distance between the body and the arm; some fix as it were the blade-bone, and twist it slightly, placing it in a straight line for the pulling of others; and the most important bend and pull down the elbow. Two muscles may be noticed in particular. One which has already been noticed forms the lump on the front of the arm when the wrist is brought close to the shoulder, is called the "biceps," because it has two heads or points of adhesion to the blade-bone, not far from the joint of the arm-bone. The fibres pass over the arm from the blade-bone down to one of the bones of the fore-arm, in front of the bend of the elbow, and when they contract they tend to bend the elbow and bring the wrist near the shoulder, or the shoulder near the wrist when the fingers are fixed or clasping. The biceps of the Gorilla is a vast muscle, but it wants the symmetry of that of man, and it does not taper downwards so as to make the arm narrower above the elbow. Another muscle is at the back part of the arm, and from having three upper heads or attachments is called the "triceps." Two of the heads are attached to the arm-bone, and one to the blade-bone, and the lower one is fixed on to the piece of bone of one of the fore-arm bones, on which the arm rests when "elbows are on the table." Its action is to drag the blade-bone towards that bone, and it is assisted in this by a muscle which passes from the spine to the arm-bone, and whose office in climbing is to drag the spine towards the arm. Finally, there are numerous muscles which

pass from the long spines of the pieces of the back-bone (vertebræ) to the blade-bone, and which in climbing tend to drag the first towards the last-mentioned bones, and to move the body generally upwards. The huge size of the blade-bone assists in this in the Gorilla, as its large surface can give adhesion to larger muscles than a smaller one; and as the arm-bones are large, there is all the more room for muscular play.

Considering the bulk of the body of a Gorilla, and the nature of the movements of climbing, it is to be expected that those muscles and bones which are connected, as just stated, with the blade-bone, should be large and strong. This is remarkably the case. On examining the back of a Gorilla one is struck with the great projection of the back-bones in the neck. In man each back-bone or vertebra has a projection or spine which sticks out backwards more or less. These are small in the region of the neck, but in the Gorilla these spines are very long there, and give a peculiar hump-necked appearance. Their size, however, is in exact relation with the size and strength of the muscles attached to them, and some of these go to the blade-bone to assist in the act of climbing.

It is this hump-necked appearance and the round-backed look produced by the great size of the blade-bones which makes a Gorilla so ugly about the chest and head, but beauty is of much less use in an African forest than good stout bones and active muscles.

The hind part of the neck does not form a graceful curve as in a well-made man, but a projection which gradually slopes into the line of the back. Moreover, the shoulders of the Gorilla do not slope from the neck—on the contrary, their direction is that which renders the hand-over-hand movement of climbing the readiest of commencement. They are "high," as the term is, the head and neck being as it were sunken between them, so that the chin, instead of being on a much higher level than the top of the breast-bone, is naturally lower than it. The front of the neck is thus hidden by the huge lower jaw.

Gorillas have collar-bones which are in the same position as those of men, but they are straighter, stouter, and stronger: they are not placed almost horizontally between the front of the blade-bone and the breast-bone, as in us, but as the shoulders are "high" they slant downwards to the breast-bone. By placing the hand on the upper part of the opposite side of the chest the collar-bone may be felt with the tips of the fingers like a ridge, and it is one which many know to their cost is very readily broken by a fall on the end of the shoulders. The bone is something like the letter *f* in outline, without the cross-bar, and it is fixed at both ends: so when a force acts on one end in the direction of the length of the bone it tends to bend, and often cracks and breaks across.

Now a fractured collar-bone would be a serious thing to a Gorilla; he could no longer lift up his arm, and he would be in constant peril and difficulty; hence, Nature has given him not only a very strong and straight bone, but has by the "high" shoulder posture rendered a fall on the top of it almost impossible. A fall would probably injure the upper part of the arm, which is well protected by the thick cushion of muscle, flesh, and hairy skin which covers the bone.

Travellers and hunters have noticed the rapidity and ease with which the Gorilla moves when off the ground, and when the size and the weight of the animal are considered it becomes evident that not only must it have great muscular power but a stout heart, good circulation, and capital "wind."

It must be remembered also that it is a great eater of vegetable food, and that it has to consume a large quantity to obtain a supply of nourishment: in other words, it has a very capacious stomach, which has to be carried about and kept very well filled.

In order to meet these requirements there is a very capacious chest (much more so than in man), which contains the large lungs and heart, and the belly is flaccid and large, so that the stomach need not press upwards and interfere with the breathing, or with the action of the circulation. Man has twelve ribs on either side, but the Gorilla has thirteen, each of which is longer, stouter, and broader than ours, the result being to make the cavity enclosed by them the greater, but apparently less readily influenced by the muscles of respiration.

When we breathe deeply and endeavour to inspire more than is usual we employ certain muscles which act on the ribs, enlarging the cavity of the chest, and then diminishing it as the expiration occurs. The larger the spaces between the ribs, and the more elastic the ribs themselves, the greater is their possible amount of movement. In us it is very great in the child, great in man, but much less in old age, when the elasticity of the ribs diminishes. In the Gorilla, the breadth and strength of the ribs

keep the cavity of the chest always vast, and certainly from their solidity and from the small space which exists between the successive ribs, great and unusual efforts of respiration are not very possible. So large is the cavity of the chest in the Gorilla, and so capacious are the lungs, that it is possibly not necessary for it to put itself out of breath, and to call extraordinary muscular exertion into play, during its uneventful life.

Having thirteen ribs on either side, and each rib being attached to a separate bone of the spine, the Gorilla has therefore one more spine bone (vertebra) than man, and is all the more long-backed. Moreover, the breast-bone, which is on the front of the chest, is broader in the Gorilla than in man, and at least one-third longer, thus adding to the capacity of the cavity of the chest, making it of about 500 cubic inches; that of man being 330 cubic inches.

The lungs and heart of the great Ape resemble those of man, and the great arteries are given off from the main blood-vessel in the same manner in both.

The Gorillas appear to be great eaters, and to roam about, either in small bands or alone, seeking for their favourite food in the forest, and the plantations close by. Sometimes they seek the high plains and rough ground of the hills, especially where certain trees are found, and they invariably cling to the forests about water. They eat the cabbage of the palm nut tree, and partake of the papau, banana, and amomum fruits. Wild sugar-canes attract them, and they are especially fond of the succulent white parts of the pine-apple and its leaves. Some hard kinds of nuts are readily cracked with their huge teeth, which are also brought into use in tearing open the stems of juicy plants.

All the examinations of the dead bodies of the Gorillas prove their diet to consist of such things, and the remains of berries, pine-apple leaves, and other vegetable matters were found, but not flesh or anything like it. This food is, however, not very nourishing, and it must be taken in large quantities and frequently. Hence the animal must not only have good climbing powers to get his food, but a large stomach and intestines to digest it rapidly. There is no doubt that the figure of the Gorilla testifies to its kind of food. The abdomen is very large, and sticks out when the animal is in the erect position; its paunch is vast, and therefore the bones which support it below, or the haunch bones, are very wide.

These haunch-bones form part of a girdle of bones which, in a skeleton, unites the legs to the spine, and which contains, in living animals, the bladder, part of the reproductive organs, and the unborn young.

It is called the pelvis, or basin-shaped bone (being very unlike one); its upper edge is formed by the expanded haunch, or ilium bones (ilium, or gut, alluding to the support given by the bone to the bowels), and its lower one by the bones on which men and Gorillas sit, or the hip (the ischium, or hip-bone). In the Gorilla the pelvis is enormous, and the edge of the haunches is long, so as to give attachment to the muscles which enclose the vast digestive apparatus behind and at the side, but it does not form a graceful curve behind and below, for certain muscles which are of great use to man in maintaining the erect posture, and which straighten the thigh in the body, are weak in the great Ape. These muscles originate outside and below the top of the haunch, and when large and strong, require a peculiar shape of bone: they form in man what does not exist in the Gorilla, and that in which the Hottentot Venus glories. But the Gorilla can sit just as well upon a pair of short and expanded hip-bones (ischial tuberosities, in the language of anatomists), and as he has no tail (the bones forming it in other Monkeys being diminished in number and united in a short process), he can do so for a considerable time with comfort. The sitting in the upright position is moderately easy to the Gorilla, and the older ones evidently often do so. They squat and rest their broad backs against a tree, and as this is a very constant and favourite position, they wear a good deal of their back hair off.

The fate of a hunter is thus given by Du Chaillu, who pledges himself to three very debatable points: that the Gorilla meets its enemy erect; stands and fights; and kills by a blow across the abdomen:—"We set off towards a dark valley where Gambo said we should find our prey. The Gorilla chooses the darkest, gloomiest forests, for its home is found on the edges of the clearings only when in search of plantains, sugar-canes, or pine-apples. Often they choose for their peculiar haunt a wood, so dark that even at midday one can scarce see ten yards. This makes it the more necessary to wait till the monstrous beast approaches near before shooting, in order that the first shot may be fatal. It does not often let the hunter reload. Our little party

separated, as is the custom, to stalk the wood in various directions. Gambo and I kept together. One brave fellow went alone, in a direction where he thought he could find a Gorilla. The other three took another course. We had been about an hour separated, when Gambo and I heard a gun fired, but a little way from us, and presently another. We were already on our way to the spot, where we hoped to see a Gorilla slain, when the forest began to resound with the most terrific roars. Gambo seized my arm in great agitation, and we hurried on, both filled with a dreadful and sickening alarm. We had not gone far when our worst fears were realised. The poor brave fellow, who had gone off alone, was lying on the ground in a pool of his own blood, and I thought, at first, quite dead. His bowels were protruding through the lacerated abdomen. Beside him lay his gun. The stock was broken, and the barrel was bent and flattened. It bore plainly the marks of the Gorilla's teeth. We picked him up, and I dressed his wounds as well as I could with rags torn from my clothes. When I had given him a little brandy to drink he came to himself, and was able, but with great difficulty, to speak. He said he had met the Gorilla suddenly, and face to face, and that it had not attempted to escape. It was, he said, a large male, and seemed very savage. It was in a gloomy part of the wood, and the darkness I suppose made him miss. He said he took good aim, and fired when the beast was only about eight yards off. The ball merely wounded it in the side, and it at once began beating its breasts, and with the greatest rage advanced upon him. To run away was impossible, for he would have been caught in the jungle before he had gone a dozen steps. He stood his ground, and, as quickly as he could, reloaded his gun. Just as he raised it to fire, the Gorilla dashed it out of his hand, the gun going off in the fall; and then in an instant, and with a terrible roar, the animal gave him a tremendous blow with its immense open paw, frightfully lacerating the abdomen, and with this single blow laying bare part of the intestines. As he sank bleeding to the ground, the monster seized the gun, and the poor hunter thought he would have his brains dashed out with it. But the Gorilla seemed to have looked upon this also as an enemy, and in his rage almost flattened the barrel between his strong jaws."

In spite of this anecdote, and some drawings by Du Chaillu, which represent the Gorilla standing erect, it is very doubtful, from anatomical reasons, whether this is possible. The comparative smallness of some of the most important muscles in the Gorilla, which in man produce the erect position, has already been noticed, and it is now necessary, for the same reasons, to examine into the nature of the lower limbs.

The thigh-bone (called from the Latin, *femur*) of the Gorilla is shorter than the arm-bone, the reverse being the case in man; and hence the Ape appears to be too short in the legs for its long body and arms. It is stout and rather straight, and has not the forward bend of the same bone in man: moreover, some well-marked ridges which run down the back of it, and which were exceedingly well developed in the oldest races of men, are deficient in the Gorilla. The same may be said for the markings on the bone, which indicate the presence of powerful muscles whose action is to keep the thigh straight with the back—or in other words, to keep the body erect. Below the knee are the two bones of the leg: the inner one, or shin-bone (the tibia), is very short for the height of the animal, and the joint on its lower part, on which moves the ankle-bone, is not so deep and perfect as in man, whose weight is constantly to be borne on it whilst it is being moved in walking. The little outside bone, called *fibula*, or the clasp-bone, in the Gorilla is so made that it adds singularly to the inability to maintain the erect posture whilst walking, and even in standing still. The lower end of this bone in man forms the prominence outside the ankle, and covers and protects the outside of the topmost bone of the ankle, to which the foot is attached. It strengthens it and prevents that turning in of the foot, which is antagonistic to the placing the sole flat on the surface of the earth, so that it can receive the weight of the body on its broad space and allow of the position so characteristic of man. In the Gorilla this bone does not come down as far as the ankle, and all the safeguards against in-twisting are not present. Why, is clear enough, because the Gorilla treads on the outside of its foot-like hand, and always has the sole turned in. There are some other points which require to be noticed, however, about the leg. It is short and evidently wanting in "calf." It is therefore deficient in that symmetry of which many mortals are most proud. Nevertheless, it has a high instep, also a human desideratum; but in spite of this the ankles are thick and shapeless looking. The tendon which

reaches from the calf to the back heel-bone (os calcis) gives a slender appearance to the lower limb of man, but there is no myth about a Gorilla having been held by that slim spot and dipped in Styx, to be for ever invulnerable elsewhere. This tendon (tendo Achillis) so characteristic of man, is supplied with muscular fibres to close to its insertion into the heel-bone in the Gorilla, which thus gains in strength what it loses in elegance. A snapping of the tendon would be indeed a grave matter in the huge Ape, and Nature has thus provided against this accident.

The thick ankles of the Gorilla are rather exaggerated by the hair which covers them, and

HUNTING THE GORILLA.

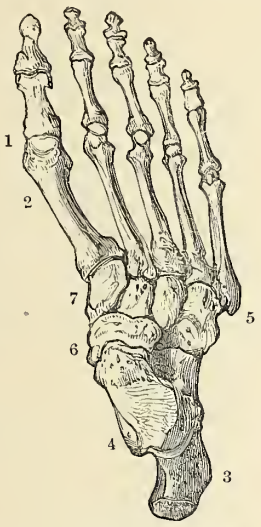
it is found over the whole of the upper surface of the foot to the clefts of the toes. The sole is not thus covered, and its bare state enables grasping to be performed with ease, while the absence of hair assists the delicacy of the sense of touch. Another cause of the ugly appearance of the foot is the backward projection of the heel, and the hand-like look is of course given by the great toe-thumb, which projects from the side of the foot at an angle of 60 degrees at least. The sole is narrow behind, and expands to where the great toe-thumb projects, so as to become very wide close to the clefts between the other toes. It is marked with lines or indentations, and there is a kind of pad beneath the ball of the great toe-thumb. The Gorilla seizes objects and grasps boughs with its feet, the great toe-thumb being exceedingly movable to and fro as well as across the sole of the foot. Hence the hand-like appearance of the foot and the thumb-like appendage of the great toe. Yet it is a foot, and the movable toe is not really a thumb.

Each kind of animal must be compared with others, some of which appear to be more complicated and some less highly organised, so that its peculiar construction can be comprehended. Man, as the perfection of living forms, is naturally considered the model or type with which all others should be compared, and therefore anatomists who begin by studying man name the bones, muscles, and other structures of animals after his. That is to say, any of their structures which are comparable with those of man, by their native position and use, are named similarly.

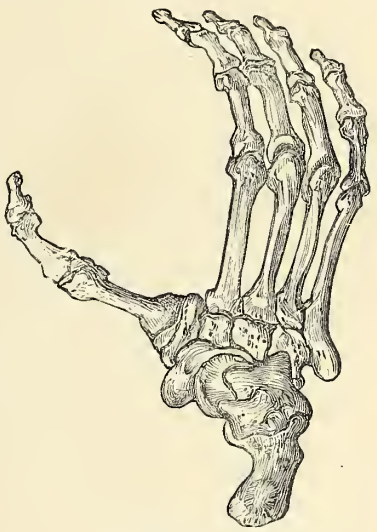
The question then arises, and can of course on this principle be answered, are the hinder extremities of the Gorilla feet or hands? do they resemble human feet or human hands in their anatomy, or in the arrangement of their bones, muscles, leaders, and blood-vessels?

By placing side by side the joined bones of the foot of man and those of the hind extremity of the Gorilla, it will be observed that the same number are present, and that they can be compared, as regards their shape and position, in a most remarkable and satisfactory manner.

A human foot is composed of three parts, so far as its bones are concerned. These are the toes, or the very movable bones in the front of the foot (1), and then there are five slender bones (2) placed side by side, and reaching from the toes to the pieces forming the back of the foot or ankle. The five bones thus parallel, and situated between the beginning of the toes and the ankle-bones, are counted from within outwards. That attached to the great toe is the first, and that to the little toe is the fifth. These are called metatarsal bones, and give length and narrowness to the foot, and they can be readily felt with the finger on our own bodies.



BONES OF THE ANKLE AND FOOT OF MAN.



BONES OF THE ANKLE AND FOOT OF THE GORILLA.

Behind them are the seven bones of the "tarsus," or ankle, all connected together in a strong arch, and jointed in front to the five bones just mentioned, and above to the two bones of the leg. The hindmost part of the ankle or heel is formed by the heel-bone, os calcis (3), which forms the back part of the arch of the sole. The Achilles tendon is united to it behind, and above it is jointed with a bone, on which rest the bones of the leg, the astragalus bone (4), so called from the Greek word, which means a "die," for the boys and men in the olden time tossed these bones, and played with those of the sheep as modern boys do.

There are two bones of the ankle just in front of these; one in contact with the heel-bone is called, from its shape, the cuboid or cube-shaped bone (5), and the other, jointed to the astragalus, is, from its faint resemblance to a boat or hull of a ship (navis), termed the navicular bone (6). In front of these two are three others placed side by side, and jointed in front to some of the metatarsal bones. They are called, from their wedge-shaped outlines (wedges for the arch of the foot), cuneiform bones (7), and there are the inner, middle, and outer of them. The inner is curved on its front surface, and has a joint there for the end of the slender (metatarsal) bone of the great toe. It is longer than the next wedge-shaped bone, so that just a little spot of the second slender bone of the second toe touches it close to the corresponding one of the great toe. This inner wedge-shaped bone, the metatarsal bone of the great toe, and the joints of the toe itself, are all on a line, which is parallel to the bones of the next and other toes. The middle and the outer wedge-shaped bones have each a slender metatarsal bone attached to them, and the two remaining slender metatarsals are jointed on to the cube-shaped bone which projects in front of the heel-bone (os calcis). It is the length in front, and the solidity and arched form of the ankle, together with the *parallel* direction of all the slender

metatarsal bones, which give the human foot its beauty of form, strength, and ability to sustain the weight of the body flat on the sole. Compare the hinder grasping (so-called) hand of the Gorilla with this.

At first sight there is a great difference, for the great toe and its metatarsal bone form *an angle* with the bones of the other toes and their metatarsals. Instead of the toes and their slender bones being parallel and fixed in this position, the great toe of the Gorilla has a power of moving so as to cross the foot more or less below, as the human thumb can cross the palm. It has also the capacity of being stretched out from the foot, so that its movements greatly resemble those of a thumb. In fact, we want a word to express a toe-thumb.

On examining the foot more carefully, it will be found that each of its bones may be compared and identified in position and office with one of man. There is a heel-bone with a great projection behind, for the fixing on of the Achilles tendon, and this is jointed on to a bone above, like the human die-bone or astragalus, and to one in front, like the cuboid. The astragalus resembles that of man, but the upper and outer surfaces on which the lower ends of the leg-bones move, are slightly different, so as to admit of greater turning in of the ankle. The wedge-shaped bones are there, and the inner one, with its joint for the slender bone of the great toe, is shorter and broader than in man, so as to allow of great movement of the toe-thumb in front of it. The slender bones, or metatarsals, are larger and longer, but their shape and direction, with the exception of the first, are singularly like those of man. As a whole the foot of the Gorilla, for thus it must be called, is broader in front of the ankle-bones and longer everywhere than in us, but it has a sideway and almost club-foot look about it; its position is "turned in," like the foot of a young child before it walks. This is owing to the conformation and easy jointing of the bones of the ankle and foot, and also to the action of a front muscle of the leg which pulls the very movable bones inwards. The structures allow of a very ready turning in of the ankle and foot, and such as would render climbing easy with the aid of the toe-thumb; but they evidently interfere with the steadiness in walking. It is a huge foot, and it is only half an inch or so shorter than the leg below the knee; it is unwieldy as a foot, but is a capital foot-hand, which cannot readily have its toes stretched out straight, for their usual position is that of being slightly bent in the direction of the sole.

Mr. Walker purchased from a native a fine healthy male Gorilla, apparently about two years of age, and shipped it for England. Being under the impression that he had taken too much care of all the other living ones which he had obtained at different times, he determined to let the new acquisition have its own way, and only take care that it did no mischief. When purchased, the animal was by no means strange or spiteful, but rather what may be termed shy, and suspicious of strangers. At the expiration of about a week, however, it became sufficiently tame and confiding to admit of its being allowed to run about loose, and to do as it liked. At the same time its food, instead of being confined to the fruits on which it is supposed to feed in its wild state, consisted in general of fragments from the table, and beside these it had anything edible it could lay its hands on, and occasionally a basin of condensed milk and a raw egg beaten up in it was given. It liked amomum fruit, but this produced diarrhœa, which had to be treated with chlorodyne and raw egg. Finding that the animal became restive, it was left entirely to its own devices, and especially as every one in the ship was at the same time so very busy as not to be able to pay much attention to it. It soon became quite at home, alternately eating, sleeping, and playing with a large bull-terrier (of by no means the most amiable disposition), which had a most decided dislike to negroes, but nevertheless took very kindly to the Gorilla, so that the two animals became constant playfellows. By allowing the Gorilla to rough it, instead of watching it, and appointing someone to take care of it, in which case these animals become so much attached to their keeper or attendant, that a separation from him almost invariably causes these affectionate Apes to pine away and die, and by habituating it to such food as is generally to found on shipboard, it was hoped that it might be brought to England. But accidents will happen, even to Gorillas. It came down to dinner one day, and ate scraps with the dog, and went to sleep. When looked for, some hours afterwards, it was missing, and must have fallen off the taffrail into the sea. Strangely enough, this young one was not given to climbing. It will be noticed that these remarks are totally at variance with those of M. Du Chaillu, who was impressed with the untamable character of the Gorilla; so we must wait until further evidence is produced, and probably until a little Gorilla is safely lodged in the Regent's Park.

Many attempts have been made to obtain a live Gorilla for exhibition in Europe, and some years since a showman really had one which he called a Chimpanzee, but the fact was not known to scientific men until a photograph of the creature was exhibited after its death. In June, 1876, Mr. Moore, the learned curator of the Free Public Museum, wrote to the *Times* after seeing a young Gorilla in that town. He stated—"A veritable young living Gorilla was yesterday brought into Liverpool by the German African Society's Expedition, which arrived by the steamship *Loanda*, from the West Coast. The animal is a young male, in the most perfect health and condition, and measures nearly three feet in height. Its beetling brows, flattened podgy nose, black muzzle, small ears, and thick fingers, cleft only to the second joint, distinguish it unmistakably from the Chimpanzee.

"Could it have graced our own Zoological Gardens it would have been the lion of the day; for, in addition to the great scientific interest of the species, the abounding life, energy, and joyous spirits of this example would have made it a universal favourite. Courteously received at Eberle's Alexandra Hotel by the members of the Exhibition, I found the creature romping and rolling in full liberty about the private drawing-room, now looking out of the window with all becoming gravity and sedateness, as though interested, but not disconcerted, by the busy multitude and novelty without, then bounding rapidly along on knuckles and feet to examine and poke fun at some new comer; playfully mumbling at his calves, pulling at his beard (a special delight), clinging to his arms, examining his hat (not at all to its improvement), curiously inquisitive as to his umbrella, and so on with visitor after visitor. If he becomes over excited by the fun, a gentle box on the ear would bring him to order like a child, like a child only to be on the romp again immediately. He points with the index finger, claps with his hands, pouts out his tongue, feeds on a mixed diet, decidedly prefers roast meats to boiled, eats strawberries, as I saw, with delicate appreciativeness, is exquisitely clean and mannerly. The palms of his hands and feet are beautifully plump, soft, and black as jet. He has been eight months and a half in the possession of the Expedition, has grown some six inches in that time, and is supposed to be between two and three years of age." All other attempts here failed, and hence we have to rely upon the word of men who tell very different stories regarding the behaviour of the Gorilla in captivity. All are agreed that adults have never been kept, but Du Chaillu and others have had young ones to watch and observe.

Du Chaillu insists on the ill-temper, ferocity, and untamable nature of the young Gorilla, as the results of his experience. One was brought to him about three years of age, with its neck put in the cleft of a stick to keep it quiet, and after much trouble they got it into a bamboo cage. It was a little black thing of two feet six inches in height, and its habits, escapes, and death are amusingly told. "As soon as I had the little fellow safely locked in his cage, I ventured to approach to say a few encouraging words to him. He stood in the furthest corner, but, as I approached, he bellowed and made a precipitate rush at me; and though I retreated as quickly as I could he succeeded in catching my trouser leg, which he grasped with one of his feet, and tore, retreating immediately to the corner furthest away. This taught me caution for the present, though I had a hope still to be able to tame him. He sat in his corner looking wickedly out of his gray eyes, and I never saw a more morose or more ill-tempered face than had this little beast. The first thing was, of course, to attend to the wants of my captive. I sent for some of the forest-berries which these animals are known to prefer, and placed these and a cup of water within his reach. He was exceedingly shy, and would neither eat nor drink till I had removed to a considerable distance. The second day found Joe, as I had named him, fiercer than the first. He rushed savagely at any one who stood even for a moment near his cage, and seemed ready to tear us all to pieces. I threw him some pine-apple leaves, of which I noticed he ate only the white parts. There seemed no difficulty about his food, though he refused now, and continued during his short life to refuse, all food except such wild leaves and fruits as were gathered from his native woods for him. The third day he was still morose and savage, bellowing when any person approached, and either retiring to a distant corner or rushing to attack. On the fourth day, while no one was near, the little rascal succeeded in forcing apart two of the bamboo rails which composed his cage, and made his escape. I came up just as his flight was discovered, and immediately got all the negroes together for pursuit, determining to surround the wood and recapture my captive. I was startled by an angry growl issuing from under my low bedstead. It was Master Joe, who lay there hid, but anxiously watching my movements. I instantly shut the windows, and called to

my people to guard the door. When Joe saw the crowd of black faces he became furious, and, with his eyes glaring, and every sign of rage in his little face and body, got out from beneath the bed. We shut the door at the same time and left him master of the premises, preferring to devise some plan for his easy capture rather than to expose ourselves to his terrible teeth. How to take him was now a puzzling question. He had shown such strength and such rage already, that not even I cared to run the chance of being badly bitten in a hand-to-hand struggle. Meantime Joe stood in the middle of the room looking about for his enemies, and examining, with some surprise, the furniture. I watched with fear, lest the ticking of my clock should strike his ear, and perhaps lead him to an assault upon that precious article. Indeed, I should have left Joe in possession, but for a fear that he would destroy the many articles of value or curiosity I had hung about the walls. Finally, seeing him quite quiet, I dispatched some fellows for a net, and opening the door quickly, threw this over his head. Fortunately we succeeded at the first throw in perfectly entangling the young monster, who roared frightfully, and struck and kicked in every direction. I took hold of the back of his neck, two men seized his arms, and another the legs, and thus held by four men this extraordinary little creature still proved most troublesome. We carried him as quickly as we could to the cage, which had been repaired, and there once more locked him in. I never saw so furious a beast in my life as he was. He darted at every one who came near, bit the bamboos of the house, glared at us with venomous and sullen eyes, and in every motion showed a temper thoroughly wicked and malicious. As there was no change in this for two days thereafter, but continual moroseness, I tried what starvation would do towards breaking his spirit; also, it began to be troublesome to procure his food from the woods, and I wanted him to become accustomed to civilised food, which was placed before him. But he would touch nothing of the kind; and as for temper, after starving him twenty-four hours, all I gained was that he came slowly up and took some berries from the forest out of my hand, immediately retreating to his corner to eat them. Daily attentions from me for a fortnight more did not bring me any further confidence from him than this. He always snarled at me, and only when *very* hungry would he take even his choicest food from my hands. At the end of this fortnight I came to feed him, and found that he had gnawed a bamboo to pieces slyly, and again made his escape. Luckily he had but just gone; for, as I looked around, I caught sight of Master Joe making off on all-fours, and with great speed, across the little prairie, for a clump of trees. I called the men up, and we gave chase. He saw us, and before we could head him off made for another clump. This we surrounded. He did not ascend a tree, but stood defiantly at the border of the wood. About one hundred and fifty of us surrounded him. As we moved up he began to yell, and made a sudden dash upon a poor fellow who was in advance, who ran, tumbled down in affright, and, by his fall, escaped, but also detained Joe sufficiently long for the nets to be brought to bear upon him. Four of us again bore him, struggling, into the village. This time I could not trust him to the cage, but had a little light chain fastened around his neck. This operation he resisted with all his might, and it took us quite an hour to securely chain the little fellow, whose strength was something marvellous. Ten days after he was thus chained he died suddenly. He was in good health, and ate plentifully of his natural food, which was brought every day for him; did not seem to sicken until two days before his death, and died in some pain. To the last he continued entirely untamable; and, after his chains were on, added the vice of treachery to his others."

In one of his hunting excursions Du Chaillu obtained a younger Gorilla than the last, but its end was sad enough.

"I was accessory to its capture," writes Du Chaillu, "and we were walking along in silence, when I heard a cry, and presently saw before me a female Gorilla, with a tiny baby Gorilla hanging to her breast and sucking. The mother was stroking the little one, and looking fondly down at it; and the scene was so pretty and touching that I held my fire, and considered—like a soft-hearted fellow—whether I had not better leave them in peace. Before I could make up my mind, however, my hunter fired and killed the mother, who fell without a struggle. The mother fell, but the baby clung to her, and, with pitiful cries, endeavoured to attract her attention. I came up, and when it saw me it hid its poor little head in its mother's breast. It could neither walk nor bite, so we could easily manage it; and I carried it, while the men bore the mother on a pole. When we got to the village another

scene ensued. The men put the body down, and I set the little fellow near. As soon as he saw his mother he crawled to her, and threw himself on her breast. He did not find his accustomed nourishment, and I saw that he perceived something was the matter with the old one. He crawled over her body, smelt at it, and gave utterance, from time to time, to a plaintive cry—'Hoo, hoo, hoo!' which touched my heart. I could get no milk for this poor little fellow, who could not eat, and consequently died on the third day after he was caught. He seemed more docile than the other I had, for he already recognised my voice, and would try to hurry towards me when he saw me. I put the little body in alcohol, and sent it to Dr. Wyman, of Boston, for dissection."

Of course all the stories about the Gorilla are not believed, and those of all writers, from Hanno downwards, have been severely criticised.

A distinguished African traveller, Winwood Reade, stated that the name, leaving alone the stories, of Hanno, was a blunder, and that the word Gorilla was misapplied, because the habits of the creature do not tally with the story. The Gorillæ of Hanno were found, it is supposed, on Sherbro Island; they scaled rocks and defended themselves with stones. They could neither have been Gorillas nor Chimpanzees, but a species of Cynocephalus, or Dog-faced Monkeys or Baboons. "These animals," writes this author, "which I have seen often enough, go in troops, which Gorillas do not, and actually defend themselves with stones, a fact which I assert not only on the evidence of natives, but on the evidence of white men who have kept them in a state of captivity. They are also very ferocious, and will always defend themselves when attacked either by man or beast. I spent five months," he continues, "in the Gorilla country, and did not leave that part of Africa till I had completely satisfied myself respecting the habits of this animal. The evidence which I now lay before you is composed of statements made to me by men who had killed Gorillas. It is collected from three distinct parts of Equatorial Africa, namely, from the Balengi of the Muni River, from the Shekani and Fans, of the Gaboon, and from the Commi, Bakeli, &c., of the Fernandes Vaz. But from the last river, where Gorillas are plentiful, I obtained the most information."

"The Gorilla is found in those thick and solitary places of the forest where animal life is scarce. His food is strictly vegetable. He moves along the ground on all-fours, sometimes he goes up into trees to feed on fruit, and at night he sleeps in a large tree. When the female is pregnant, the male builds a nest, where she is confined, and which she abandons as soon as her young one is born. The Gorilla does not beat its breast like a drum. It utters a kind of short sharp bark when enraged, and its ordinary cry is of a plaintive nature. With respect to its ferocity, the hunters have a proverb, 'Leave a *Ngina* alone, and it will leave you alone.' When it is at bay, and wounded, it will attack man like the stag, the elephant, and other animals which are naturally timid. But it makes its attack on all-fours, and the hunters, who are themselves as nimble as Apes, often escape from it as men escape from the charge of an elephant. I have seen a man who was wounded by a Gorilla; his wrist was crippled, and the marks of the teeth were visible. He told me that the Gorilla seized his wrist, and dragged it into his mouth; it was contented with having done this, and then made off. The nearest approach to an erect posture which the Gorilla attains is by supporting itself by hanging on to the branches. When I asked the people of Ngumbi whether a man had ever been killed by a Gorilla, they said that their fathers had spoken of such a thing, but that nothing of the kind had happened within the memory of anybody living. Such is the evidence of the native hunters upon the habits of the Gorilla. I could not find that it differed in any important respect from the Chimpanzee, except in its superior size and strength, and in its certainly being more formidable when wounded. But when I asked the hunters which was the most dangerous, the Leopard or the Gorilla, they replied the 'Leopard.'

"I can make one or two positive assertions from my own experience. Although I never succeeded in viewing a Gorilla in its wild state, I can assert that it travels on all-fours, for I have seen the tracks of its four feet over and over again. I can assert that it runs away from man, for I have been near enough to hear one running away from me; and I can assert that the young Gorilla is as docile as the young Chimpanzee in captivity, for I have seen them both in a state of captivity. I have also seen the lying-in nests both of Chimpanzees and Gorillas, the latter being the larger of the two. The Chimpanzee has the character of being more intelligent than his big brother." This careful traveller doubted some of the stories told by M. Du Chaillu about Gorilla killing, so he went to the

neighbourhood where this slaying was said to have taken place. On arriving at the town of Ngumbi pretending to be trading, he writes, "I was asked whether I would buy Gorilias as M. Du Chaillu did. I refused to buy them, but said that I would give a large reward to any hunter who would get me a shot at one, and also a present to the King. They seemed astonished at this, and asked me why I wished to do a thing that other white men had never wished to do. Now, I had taken with me two interpreters, and managed to make them quarrel, so that there might be no collusion in the matter. I examined Etia, a hunter, in whose company M. Du Chaillu professes to have killed Gorillas, by each interpreter separately. I examined in the same manner the five guides who had escorted him in the Opingi country; and though they spoke of M. Du Chaillu in high terms, and appeared to have a great affection for him, all replied that he had never shot a Gorilla."

YOUNG GORILLA AND DOG.

Still later accounts from able naturalists confirm Winwood Reade's views, and insist upon the truth of the fact that no European has ever seen a Gorilla in its adult age alive, and in its native forests. They start off at the slightest noise, and are only hunted by natives for the sake of their bones and skins, which are valuable enough in Europe. Moreover, exception has been taken to the tales about the intractable and violent nature of the Gorilla, and more than one well-known African naturalist sides with those who disbelieve in the ferocity of the young Gorilla.

The reason why the Gorilla flourishes in Western Equatorial Africa is probably because the great Carnivora, or beasts of prey, are not found in the dense forests and open prairies which cover the country. The jungle begins where the sea ceases, and then comes the virgin forest, extending some degrees north and south of the equator, and reaching unknown distances inland. There are no Lions, and but few Leopards, Hyenas, and Jackals to be met with; and the great African beasts—the Rhinocerides, Giraffes, Zebras, &c., absent. Snakes, Lizards, and a vast insect world abound, and there are birds of prey. The Elephant is scarce, and, indeed, miles and miles may be traversed without

hearing or seeing any signs of large animal life. But of all the mammals the Monkeys are the most numerous, and the Gorilla reigns supreme. He has the forest to himself, and but few enemies. He has companions, however, nearly of his own size, and whose description we owe to Du Chaillu, and they are so constructed, anatomically, that they link on, as it were, this greatest of all Apes with the well-known Chimpanzee, which is also indigenous to the Gorilla land. The new Apes are the Nschiego Mbouvé, or Tschiego, and the Koolo-Kamba.

CHAPTER II.

THE MAN-SHAPED APES (*continued*)—THE NSCHIEGO MBOUVÉ—THE KOOLO-KAMBA—THE SOKO—THE CHIMPANZEE.

THE NSCHIEGO MBOUVÉ—Its Nests and Habits—A Specimen Shot—Differences between it and the Gorilla—Structural Peculiarities—THE KOOLO-KAMBA—Meaning of the Name—Discovered by Du Chaillu—Its Outward Appearance and Anatomy—THE SOKO—Discovered by Livingstone—Hunting the Soko—THE CHIMPANZEE—In Captivity—On board Ship—A Young Chimpanzee—The Brain and Nerves—Anatomical Peculiarities—General Remarks upon the Group.

THE NSCHIEGO MBOUVÉ.*

THIS great Ape, which attains the height of four feet, and has a spread of arms of seven feet, was discovered by Du Chaillu in the Gaboon district. It is remarkable for building very comfortable shelters, and this led to its being found; for Du Chaillu, in one of his excursions, was trudging along, rather tired of sport, when he saw a most singular-looking shelter built on the branches of a tree. He thought it had been made by the natives, and asked whether the hunters had the habit of sleeping in the woods, but was told, to his great surprise, that it was a nest built by the Nschiego Mbouvé, an Ape. Moreover, one of the natives told him that it was a curious creature, which had a bald head.

Many of the nests were seen subsequently, and it was noticed that they were generally built about fifteen or twenty feet from the ground, and invariably on a tree which stands slightly apart from others, and which had no lower bough beneath the shelter. Occasionally they are to be seen at the height of fifty feet; and it would appear that the altitude has something to do with the dread of the few flesh-eating and destructive beasts, such as the Leopard. The loneliest parts of the forest are chosen, for the animal is shy, and is very rarely seen, even by the negroes. The materials for the nest consist of leafy branches, and it is collected by the male and the female also, who tie them together, and to the tree, very neatly with twigs of the vine. The roof is so well constructed that it closely resembles human work, and it throws off the rain admirably, for it is neatly rounded at the top. During its construction, the female gathers the branches and vines, whilst the male builds; but afterwards they do not occupy the same shelter, the male making another close by in a neighbouring tree. The roof, which is usually some six or eight feet in diameter, is more or less dome-shaped, or something like an extended umbrella; and the Nschiego gets under it and clasps the tree, or squats on a bough, so that its head is just beneath the under surface. The nests are not occupied permanently, and usually for not more than eight or ten days, for the Apes, living upon wild berries of a certain kind, select spots where they are plentiful, and leave them when the store is exhausted. Du Chaillu never saw many nests together, and he does not think the animals live in troops, but only in pairs. Sometimes a solitary nest is seen, inhabited by a Nschiego, whose silvery hair denotes its age, and probably its desire for solitude after a long and troublous life.

Being desirous of obtaining one of these shelter makers, as they were evidently new to science, Du Chaillu took every precaution to surprise his prey; but it is best to tell the story in his own words:—

"We travelled with great caution, not to alarm our prey, and had a hope that, by singling out a

* The Nschiego Mbouvé; *Troglodytes Tschiégo* (Duvernoy); *Troglodytes Calvus* (Du Chaillu).

shelter, and waiting till dark, we should find it occupied. In this hope we were not disappointed. Lying quite still in our concealment (which tried my patience sorely), we at last, just at dusk, heard the peculiar ' Hew, hew, hew,' which is the call of the male to his mate. We waited till it was quite dark, and then I saw what I had so longed all the weary afternoon to see. A Nschiego was sitting in his nest. His feet rested on the lower branch, his head reached quite into the little dome of the roof, and his arm was clasped firmly round the tree-trunk. This is their way of sleeping. After gazing till I was tired through the gloom at my sleeping victim, two of us fired, and the unfortunate beast fell at our feet without a struggle, or even a groan. We built a fire at once, and made our camp in this place, that when daylight came I might first of all examine and skin my prize. The poor Ape was

THE NSCHIEGO MBOUVÉ. (*From a Stuffed Specimen.*)

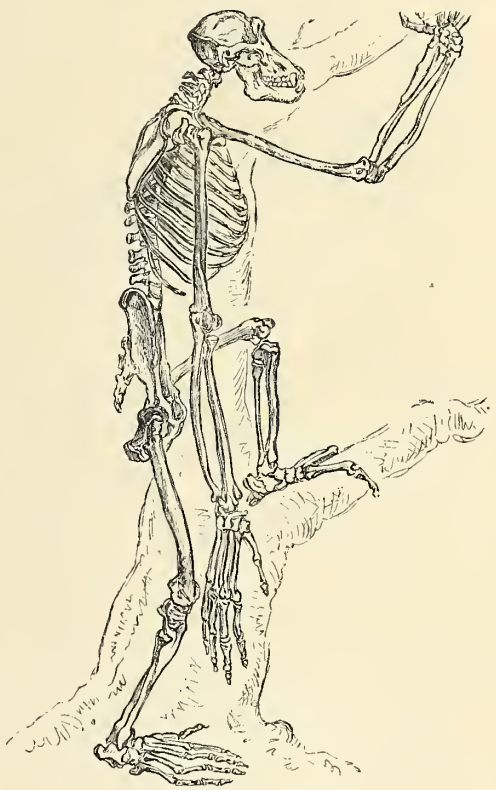
hung up to be out of the way of insects, and I fell asleep on my bed of leaves and grass, as pleased a man as the world could well hold. Next morning I had leisure to examine the Nschiego.

" I was at once struck with points of difference between it and the Chimpanzee. It was smaller, and had a bald black head. This is its distinctive character. This specimen was three feet eleven inches high, or long. It was an adult. Its skin, where there is no hair, is black, and the thick breast and abdomen are covered with short and rather thin blackish hairs. On the lower part of the abdomen the hair is thinnest, but this is not perceived unless looked at carefully, as the skin is the colour of the hair. On the legs the hair is of a dirty gray, mixed with black. The shoulders and back have black hair between two and three inches long, mixed with a little gray. The arms down to the wrist have also long black hair, but shorter than in the Gorilla. The hair is blacker, longer, glossier, and thinner in general than that on the Gorilla, and the skin is not so tough. I noticed that the bare places, where the hair is worn off by contact with hard substances in sleeping, were different from the bare places which are so conspicuous on the common Chimpanzee.

"It is not as powerful an animal as the Gorilla, its chest is not so large, but the arms and fingers are a little longer, and this is the case with the toes also. The nose is not so prominent, but the mouth is wider and the ears are larger. Its chin is rounder, and has more small hairs, and the side of the face is thinly covered with hair, commencing about the middle of the ear, and these would seem to be signs of an incipient beard and whiskers. The lower parts of the body are bare, and the skin is white there."

Apparently the disposition and temper of the Nschiego are better than those of the Gorilla; it is less ferocious, and is even docile in captivity. It has not the hideous expression of the great Ape, for there is something of a forehead above the ridge of the eyebrow, and there are no great crests on the head, which is rounder than that of the Gorilla. The teeth are rather smaller, but are of the same number. The height is less than that of the female Gorilla, as a rule; and the male of this bald kind is larger than its female; whilst the little young ones differ in their colour from both, being white. Finally, it would appear that there are hard callous pads on the back of the fingers, that the hand is larger than the feet, and that the tips of the fingers reach a little below the knee.

Associated with the Gorilla and with the Chimpanzee in the forests of Equatorial Western Africa, the Bald-headed Troglodyte appears to have a restricted geographical range, and not to be found over so large a district as its companions, for it was only met with on the table-lands of the interior, and in the densest forests.



SKELETON OF NSCHIEGO.

Subsequently he had a very good opportunity of substantiating his statements about the nests.

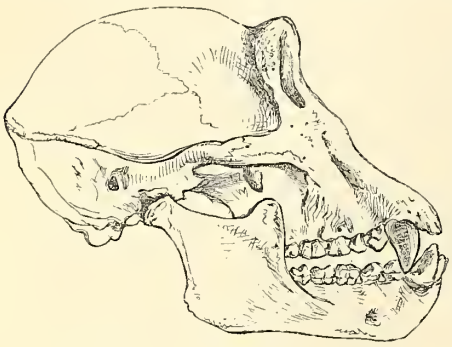
"On our way down, at sunset of the third day, we heard the call of a Nschiego Mbouvé (*Troglodytes calvus*). I immediately caused my men to lie down, and was just getting into a hiding-place myself, when I saw, in the branches of a tree at a little distance, the curious nest or bower of this Ape; hard by, on another tree, was another shelter. We crept up within shot of this nest, and then waited, for I was determined to see once more the precise manner in which this animal goes to rest. We lay flat on the ground, and covered ourselves with leaves and bush, scarcely daring to breathe, lest the approaching animal should hear us. From time to time I heard the calls. There were evidently two, probably male and female. Just as the sun was setting, I saw an animal approach the tree. It ascended by a hand-over-hand movement, with great rapidity, crept carefully under the shelter, seated itself on the crotch made by a projecting bough, its feet and haunches resting on this bough; then it put one arm about the trunk of the tree for security.

Thus, I suppose, they rest all night; and this posture accounts for some singular abrasions of hair on the side of the Nschiego Mbouvé. At a little distance off I saw another shelter made for the mate. No sooner was it seated than it began again to utter its call. It was answered; and I began to have the hope that I should shoot both animals, when an unlucky motion of one of my men roused the suspicions of the Ape in the tree. It began to prepare for descent, and, unwilling to risk the loss of this one, I fired. It fell to the ground dead. It proved to be a male, with the face and hands entirely black. As we were not in haste, I made my men cut down the trees which contained the nests of these Apes. I found them made precisely as I have before described, and as I have always found them, of long branches and leaves, laid one over the other very carefully and thickly, so as to render the structure capable of shedding off water. The branches were fastened to the tree in the middle

of the structure by means of wild vines and creepers, which are so abundant in these forests. The projecting limb on which the Ape perched was about four feet long. There remains no doubt in my mind that these nests are made by the animal to protect it from the nightly rains. When the leaves begin to dry to that degree that the structure no longer throws off water, the owner builds a new shelter, and this happens generally once in ten or fifteen days. At this rate the Nschiego Mbouvé is an animal of no little industry."

Du Chaillu had an excellent opportunity of studying the animal, for he was fortunate enough to capture a young one, but was not able to keep it alive for any length of time.

The differences between the outside appearance and the intelligence and temper of this Bald-headed Ape and those of the Gorilla are accompanied by certain internal ones. A careful examination of the skull of the Tschiégo, as its clever French describer, Duvernay, calls it, shows that it has smaller ridges, a less prominent muzzle, and a wider and shorter roof of the mouth than the Gorilla. The last of the upper crushing, or back teeth, is the smallest. In the Gorilla they are nearly equal in size. The lower jaw in the Nschiego has three nearly equal-sized molar or back teeth, and the first and the second have five projections or cusps, but the last has only four. In the Gorilla it has five cusps. These minute differences are probably constant, and therefore must not be passed over, although they may seem to be of no importance to the creatures. But the classification of animals can only depend upon the presence or absence of structural peculiarities; and when such and such a structure exists in one, and not in another, they cannot both be of the same kind. According to the relation of the structure to the life, and according to its being constantly found, so is it important in deciding whether the "kind" is a species, or a mere variety or race.



SKULL OF NSCHIEGO.

The great distinction between the two animals is that the Nschiego's forehead, formed by the frontal bone, rises up from the great brow ridge, and is visible from the front. This is not the case with the Gorilla, whose forehead recedes greatly. Both animals have the same number of ribs (thirteen), but those of the Nschiego are more man-shaped and are not so broad and close together; and their chests differ in breadth, for the breast-bone of the new Ape is narrower, but it is long and thick. The blade-bone, so important in the Gorilla, is equally so to the Nschiego, but it is longer and narrower on the back, and its spine is very oblique. Possibly this conformation of the bone may have to do with the constant climbing of the Bald-headed Ape, but nevertheless the spines on the neck-bones, which give origin to such exceedingly strong muscles in the Gorilla, are much smaller in the Nschiego. The first neck-bone, or atlas, has no spine in this Ape, in which it is like man, and the axis, or second, has a forked spine, and is crested at the end, but otherwise is like that in man.

Finally, the rudiment of a tail is like that end of the back-bone found in a Gorilla and in man.

These are the principal matters to be noticed, and the most important distinctions, and show that the Nschiego cannot be of the same kind or species as the Gorilla, but a Troglodyte, resembling the Gorilla somewhat in its skeleton, and although smaller than the male, still quite, if not more, man-shaped.

THE KOOLO-KAMBA.*

This kind of Troglodyte is celebrated for saying koola-koolo over and over again as its favourite cry, for having a very extraordinary frog-like figure, and for being one of those creatures which are exceedingly interesting to zoologists, because they are, as it were, half one thing and half another.

A neighbour of the great Apes already noticed, it associates also with the common Chimpanzee, in the quiet forests of Western Equatorial Africa. In one of these Du Chaillu first saw it, and he describes his discovery as follows:—

"We had hardly got clear of the Bashikoway ants and their bites when my ears were saluted by

* *Troglodytes Koolo-Kamba* (Du Chaillu); *Troglodytes Aubryi* (Gratiolet and Alix).

the singular cry of the Ape I was after. 'Koola-koolo! koola-koolo!'* it said several times. Gambo and I raised our eyes, and saw, high up on a tree-branch, a large Ape. We both fired at once, and the next moment the poor beast fell to the ground with a heavy crash. I rushed up, anxious to see if, indeed, I had a new animal. I saw in a moment that it was neither a Nschiego Mbouvé, nor a Chimpanzee, nor a Gorilla. Again I had a happy day—marked for ever with red ink in my calendar. We at once disembowelled the animal, which was a male. I found in its intestines only vegetable matter and remains. The skin and skeleton were taken into camp, where I cured the former with arsenic sufficiently to take it into Obindji. The animal was a full-grown male, four feet three inches high, and was less powerfully built than the male Gorilla, but as powerful as either the Chimpanzee or Nschiego Mbouvé. When it was brought into Obindji, all the people, and even Quenqueza, at once exclaimed, 'That is a Koolo-Kamba.' Then I asked them about the other Apes I already knew, but for these they had other names, and did not at all confound the species. For all these reasons I was assured that my prize was indeed a new animal; a variety, at least, of those before known. The Koolo-Kamba has several distinctive marks: a very round head, whiskers running quite round the face and below the chin; the face is round, the cheek-bones prominent, the eyes sunken, and the jaws not very prominent, less so than in any of the Apes. The hair is black and long on the arm, which was, however, partly bare. The Koolo is the Ape, of all the great Apes now known, which most nearly approaches man in the structure of its head; for the capacity of the cranium is somewhat greater, in proportion to the animal's size, than in either the Gorilla or the Nschiego Mbouvé. Of its habits these people could tell me nothing, except that farther in the interior it was found more frequently, and that it was like the Gorilla, very shy and hard of approach." They are rare animals, and Du Chaillu met with this one only; it was as large as a female Gorilla, and from its structure was evidently a great climber.

One was killed and sent over to Paris some few years since, and its anatomy forms a great treatise by the distinguished men whose names are appended to its title, *Troglodytes Aubryi*.

They agree with Du Chaillu in his slight notice of its shape and peculiarities to a certain extent, and in his notice that the arms reach below the knee, that the shoulders are broad, and that the ears are large, but they give some very interesting descriptions of its strange characteristics. It has many points of resemblance with the Gorilla and many with the Nschiego, but it has others which cause it to be like the common Chimpanzee, and which show some likeness to the great Baboon. It fills up the gap in the animal scale between the Nschiego and Gorilla on the one hand, and the true Chimpanzee (*Troglodytes niger*) on the other; and were it not in existence, it would be necessary to divide these Apes into two groups or genera (the plural of genus), to make, in fact, a genus Gorilla and a genus Troglodytes, the first to contain the Gorilla and Nschiego, and the last the Chimpanzee. They are all therefore linked together in one genus by it, that of *Troglodytes*.

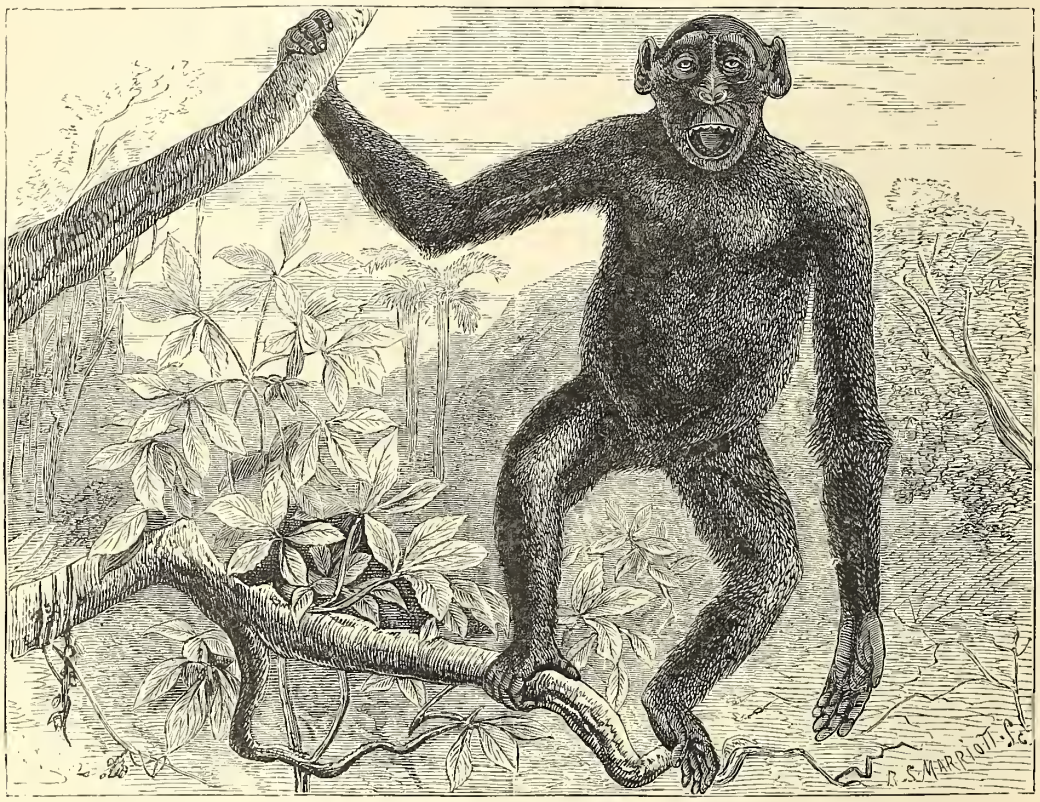
The shape and the peculiar anatomy of the Koolo-Kamba are not simply curious and only interesting to those who study dry bones, for they have to do with its habits and mode of life, and their examination is full of instruction to those who like to understand causes and effects, and design in Nature. Much has been explained in the chapter on the Gorilla regarding the different parts of the body, and if that information is considered there will be no difficulty in comprehending all about the Ape now under consideration.

The shape of the body as a whole is admirably adapted for great powers of climbing and of exertion of the limbs, and these last are adapted for the same end in a manner surpassing the great Apes already described. But, moreover, the body is peculiarly suited, not for maintaining or often using the upright portion or the legs, but for going on all-fours, like a Baboon or Dog. Doubtless the Gorilla and the Nschiego do often stand up for a short time, and their construction points at this being very possible, as their frame has a combination of structures for doing this and for climbing. Now the Koolo-Kamba must differ from them in its structure, for it requires those which enable it to invariably go on all-fours, and yet to climb better than the others.

It never wants to sit down, except with its knees drawn up to its nose, and it squats on its haunch-bones (the tuberosities of the haunch—of the "*ischium*" bone).

* Koolo is the cry, and Kambe means "to say."

The body is very ball-like, and there is no visible division between the chest, the stomach, and the hips; it is not troubled with a waist, and anything like one is positively below the hips, just over where the thighs join the body. In fact, as before noticed, the shape is that of a frog. There are no graceful curves to the back, and there is no "small" to it. On looking at the chest, it will be noticed that it is long behind and short in front; the ribs go down close to the edge of the hips; and in order that this extra stoutness and strength of loin shall be there, there are fourteen ribs, instead of thirteen, as in the other great Apes. The breast-bone in front sticks out, so that were the animal to lie on its stomach its point would lean on the ground, and not its front, as in us. This last peculiarity is an adaptation for going on all-fours. The absence of waist, and the shape of the loins, relate to the small size of one of the muscles of the back (sacro lumbalis), which is large and important in man.



THE KOOLO-KAMBA.

The belly is very large, and it is kept from pushing into the chest by the capacity given to the space within the ribs and breast-bone, by a bulged-out state of the ribs at the back, and the projection of the breast-bone. Hence, the frog-like figure looks asthmatical; and as it is very high-shouldered, there is but little neck.

All this bulging has not only reference to the maintenance of the capacity of the lungs, and its independence of the great stomach, which, when full, would tend to press in all directions, for it enables the muscles of the back and shoulders, and which have so much to do with climbing, to be large and vigorous. More space is afforded for the insertion or attachment of muscular fibres.

The blade-bone does not add to the bulk of the shoulders, for it is rather long and narrow for a great Ape; and its spine, which has so much to do with the muscles which lift up the arm, is very much aslant, and in the best direction for very constant climbing, instead of very much walking on the knuckles. And that climbing and holding on are the usual motions may be credited, it is only necessary to notice that the arms and the fingers are long, and that the tips of them touch below the

knee when the skeleton is placed upright. Moreover, this great length is accompanied by corresponding strength, and also by a very curious condition of the hands.

It has a larger hand in relation to its breadth than that of the Gorilla, and there are no bunches of muscle forming rounded swellings or balls under the thumb and little finger. On the contrary, the long and narrow palm is, as it were, bent across, as if it could fit capitally on to a bough. There is no doubt that this Ape, like all the others, does a good deal of swinging, by holding on to boughs with its hands, when the arms are straight above the head; and that they move along a bough, or from tree to tree, in this position, and without bending the elbow. This method of getting along may also be seen in Chimpanzees in the Zoological Gardens. Evidently the curved palm will be of immense advantage in such actions, and especially when it is combined, as it is in the Koolo-Kamba, with a slightly bent-downwards condition of the fingers. The bones (phalanges) of the fingers are long, and each is slightly curved, and not straight, as in man and the great Apes already noticed, so that their three bones, when in their proper position, are decidedly out of a straight line, and present a general curve, which is rendered all the more decided by the bend in the palm. All this is very useful for grasping and holding on. But it is not all; in man and the other great Apes, the wrist consists of two rows of small bones, one placed before the other: the first row is jointed to the bones of the fore-arm, at what is called the wrist-joint, which moves forwards and backwards as a hinge; and the second row is so jointed on the first row that there is no movement, and in front it is jointed to the bones of the palm, and to those of the thumb. Now in the Koolo the second row of wrist-bones —or as they are called from the Latin, *carpus*, a wrist—carpal bones *are movable* on the first row, and muscular exertion can bend, not only the metacarpal bones and the fingers, but also the wrist-bones. Hence the hand is more movable in the bending direction than that of man, and the reason is because of the peculiar requirements of the creature's life. The thumb is small, and only reaches the first joint of the forefinger: its tip can only touch the tip of one finger at a time, and not those of all, as in man, and therefore it is not of much use in distinguishing objects by touch; moreover, it cannot be stuck out far—and this is necessary, for in climbing its tip is required to be as close to the fingers as is possible. The muscles of the hands and arms resemble those of the Chimpanzee generally, and will be noticed in describing it.

When the Koolo-Kamba walks, it does so like the Gorilla, by leaning on the backs of its fingers, and hence it has callous pads on the back of their second bones. All the peculiar construction of the hands and wrist bears a relation to the vast muscular development of the muscles of the back of the chest and shoulders in the process of climbing; and it is to be observed, as it was in the instance of the Gorilla, that these muscles have more to do with such actions than those of the chest, which go to the arm, and which are so much used in man for that purpose. The muscles of the chest are not large and strong in the Apes, for, as has already been mentioned, they climb with the back of the hand towards the face, and do not attempt, like man, to lift the body with the palm and nails turned towards him. This last proceeding necessitates large chest muscles, and the former large ones at the back of the shoulders.

There is something remarkable about the haunch-bones, or those parts of them which support the body when sitting. In man they are well in front of the end of the back-bone, which tapers off and turns in a little, and forms a rudiment of a tail. These tuberosities of the haunch-bone (as they are called, because they are swollen out and flattened for the especial purpose in man) are placed, in the Koolo-Kamba, behind the end of the spine or the true rudiment of the tail, and this throws all the under parts backwards, giving the animal a thorough Baboon and animal character. Oddly enough, the rudiment of the tail in this Ape is smaller than in man.

A study of the foot shows that it is of immense use in holding on and in climbing, and of none in walking. It looks more like a small hand, furnished with a great thumb, than a foot with a toe-thumb.

It differs from human feet in the length of the toes, and this is rather an interesting artistic point, for there is some diversity in the opinions regarding which should be the longest toes in man.

The Greek statues—those grand models of the highest types of mankind—very constantly have the second toe the longest, and reaching more to the front, when the foot is on the ground, than the great toe and the third. Nowadays, after men have had their feet pinched, cabined, and confined in all sorts of boots and shoes, generation after generation, it is wonderful that their toes should be of any shape at

all; and, therefore, it must be anticipated that the Grecian type will not always prevail. Nevertheless, although the great toe is often the longest, the third toe never is, except there is some decided deformity, like double toes. It is, however, the third toe which is the longest in the Ape, just as the third finger of the hand is the longest in man; and hence the Ape's foot, with its great thumb, is in this hand-like. But as has been mentioned before, bone for bone, and almost muscle for muscle, the human and Ape's foot agree, and the hinder extremity of this last is really a foot with a toe-thumb.

On looking at the head of the Koolo-Kamba, one is struck with the large ears, which are larger than those of the Apes already described, and almost as large, but less detached, as those of the Chimpanzee. The skull is globular, and with a low contracted forehead receding behind the brow crests; but there are only faint ridges on its sides, although the muscles of the jaw are large, and they come from the sides of the skull. The head is very hairy, and the face, which is very prognathous (γναθος, jaw or mouth), or projecting in front, is black in colour. It is rendered very tigerish and ugly by the flat nose merging into a wide, thick, projecting upper lip, without any furrow; and the mouth looks like a wide slit, there being no chin, on account of the pouting nature of the great lips

Like the other Troglodytes the Koolo-Kamba has great air sacs or throat pouches, which are hidden amongst the great muscles of the neck, and enter the organ of voice, or the larynx, between the upper and lower structures for the production of vocal sound. Their size and general nature may be satisfactorily compared with those of the Gorilla, in page 22.

Having something of a voice, this Ape has a better-formed palate than the others, and its tongue has not such a jumble of papillæ or little needle points on it as they have, for the larger cup-shaped ones are arranged at the back in the shape of the letter Y. The last molar tooth of the lower jaw has five cusps.

A great eater of vegetable food, it requires a great stomach, and this has the two openings very close together, that is to say, the one for the passage of food in, and the other for the passage of food out, into the small gut. There is, as in all vegetarians by nature, a large great intestine, enormous in fact, and this ends, as in man, in a blind gut with an appendix. The cause of all this is that vegetable food does not contain much available nourishment, and large portions of it must come in contact with the mucuous or absorbing membrane of the stomach and bowels, in order that a proper quantity of nutritious matter may be absorbed, and be made into blood. The contrary is the case in flesh-eating animals, whose food contains a great percentage of nourishment; for in them the stomach and intestines are small, the surface required not being great, and nature is wonderfully economical.

THE SOKO.

This animal, both as regards its name, description, and habits, we owe to Livingstone; and the stories which he heard of it from the natives, in the strange country to the west of the great lake Tanganyika, must have wiled away many a weary hour during his ill-health and gradual loss of energy.

The first notice of it is curious enough, and occurs in his last journals. They were in want of rain, and he writes: "A Soko, alive, was believed to be a good charm for rain, so one was caught; and the captor had the ends of two fingers and toes bitten off. The Soko, or Gorilla, always tries to bite off these parts, and has been known to overpower a young man, and leave him without the ends of fingers and toes. I saw the nest of one; it was a poor contrivance—no more architectural skill shown than in the nest of our cushet dove." Here the consideration of this creature might have ended, for Livingstone terms it a Gorilla, but this name, like that of Pongo, is evidently given to all great African Apes with bad characters, and moreover, as will be noticed presently, when one of the great traveller's native companions came to England, and was shown a stuffed Gorilla, he decided that it was not the same thing as the Soko.

In another part of his journal Livingstone returns to the Soko, which he still calls the Gorilla; but in the drawings given it evidently is not one, and is neither as large in its body nor as ugly in the face; moreover, the large ears would cause it to be considered, were there not other reasons, as one of the true Chimpanzees, or *Troglodytes Niger*.

The following is an extract from Livingstone's last journal:—

"24th August.—Four Gorillas or Sokos were killed yesterday; an extensive grass-burning forced them out of their usual haunt, and coming on the plain they were speared. They often go erect,

but place the hand on the head, as if to steady the body. When seen thus the Soko is an ungainly beast. The most sentimental young lady would not call him a 'dear,' but a bandy-legged, pot-bellied, low-looking villain, without a particle of the gentleman in him. Other animals, especially the Antelopes, are graceful, and it is pleasant to see them, either at rest or in motion; the natives also are well made, lithe and comely to behold; but the Soko, if large, would do well to stand for a picture of the devil. He takes away my appetite by his disgusting bestiality of appearance. His light yellow face shows off his ugly whiskers and faint apology for a beard; the forehead, villainously low, with high ears, is well in the background of the great dog-mouth; the teeth are slightly human, but the canines show the beast by their large development. The hands, or rather the fingers, are like those of the natives. The flesh of the feet is yellow; and the eagerness with which the Manyuema devour it, leaves the

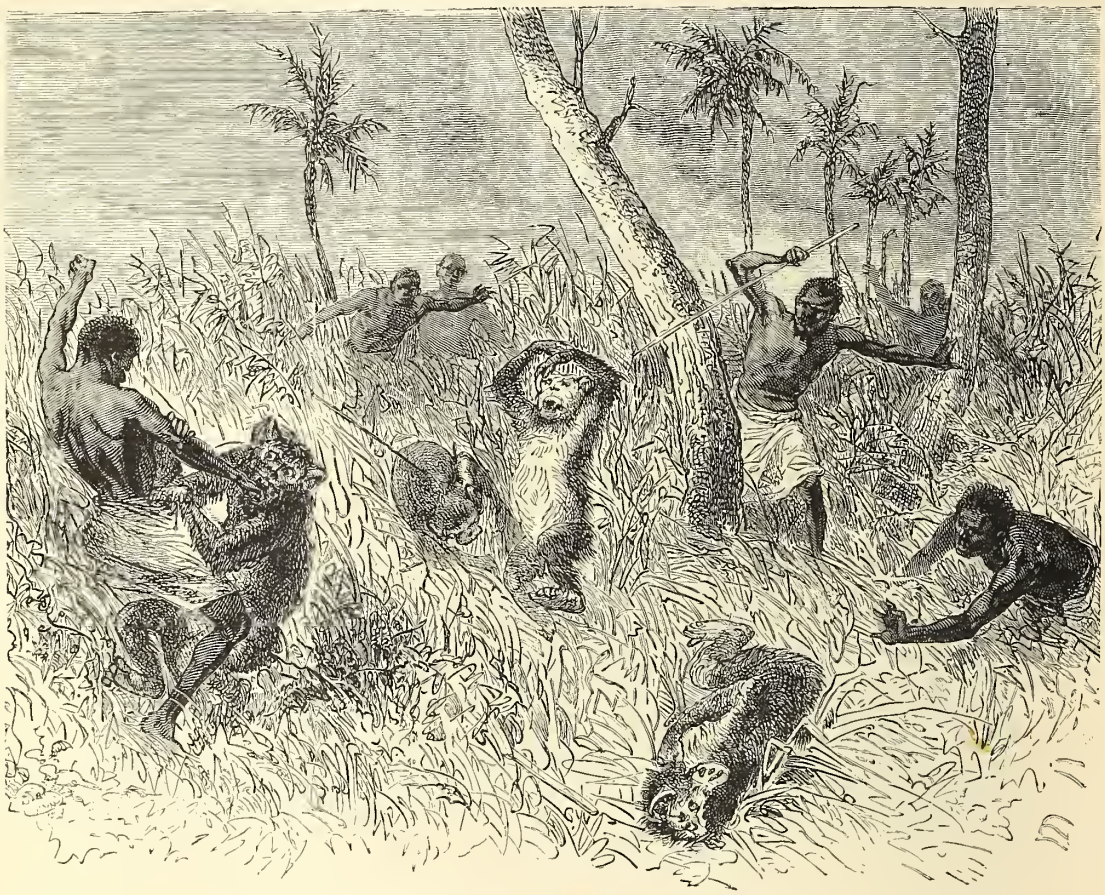
PORTRAIT OF A YOUNG SOKO. (*Copied by permission from the Engraving in Livingstone's last Journal.*)

impression that eating Sokos was the first stage by which they arrived at being cannibals; they say the flesh is delicious. The Soko is represented by some to be extremely knowing, successfully stalking men and women while at their work; kidnapping children, and running up trees with them, he seems to be amused by the sight of the young native in his arms, but comes down when tempted by a bunch of bananas, and as he lifts that, drops the child; the young Soko, in such a case, would cling closely to the armpit of the elder. One man was cutting out honey from a tree, and naked, when a Soko suddenly appeared and caught him, then let him go; another man was hunting, and missed in his attempt to stab a Soko; it seized the spear, and broke it, then grappled with the man, who called to his companions, 'Soko has caught me!' The Soko bit off the ends of his fingers, and escaped unharmed. Both men are now alive at Bambarré."

"The Soko is so cunning, and has such sharp eyes, that no one can stalk him in front without being seen; hence, when shot, it is always in the back; when surrounded by men and nets, he is generally speared in the back too, otherwise he is not a very formidable beast. He is nothing, as compared in power of damaging his assailant, to a Leopard or Lion, but is more like a man unarmed, for it does not

occur to him to use his canine teeth, which are long and formidable. Numbers of them came down in the forest, within a hundred yards of our camp, and would be unknown but for giving tongue like Fox-hounds: this is their nearest approach to speech. A man, hoeing, was stalked by a Soko, and seized; he roared out, but the Soko giggled and grinned, and left him as if he had done it in play. A child, caught up by a Soko, is often abused by being pinched, and scratched, and let fall."

"The Soko kills the Leopard occasionally, by seizing both paws and biting them, so as to disable them; he then goes up a tree, groans over his wounds, and sometimes recovers, while the Leopard dies. At other times both Soko and Leopard die. The Lion kills him at once, and sometimes tears his limbs



A SOKO HUNT. (*After a Sketch by Dr. Livingstone.*)

off, but does not eat him. The Soko eats no flesh; small bananas are his dainties, but not maize. His food consists of wild fruits, which abound, and of these one is like large sweet sop, but indifferent in taste. The Soko brings forth at times twins. A very large Soko was seen by Mohamad's hunters, sitting picking his nails; they tried to stalk him, but he vanished. Some Manyuema think that their buried dead rise as Sokos, and one was killed with holes in his ears, as if he had been a man. He is very strong, and fears guns, but not spears. He never catches women."

"Sokos collect together, and make a drumming noise, some say with hollow trees, then burst forth into loud yells, which are well imitated by the natives' embryonic music. If a man has no spear, the Soko goes away satisfied; but if wounded, he seizes the wrist, lops off the fingers and spits them out, slaps the cheeks of his victim, and bites without breaking the skin; he draws out a spear (but never uses it), and takes some leaves and stuffs them into his wound to staunch the blood; he does not seek an encounter with an armed man. He sees women do him no harm, and never molests them; a man

without a spear is nearly safe from him. Manyuema say, 'Soko is a man, and nothing bad in him.' They live in communities of about ten, each having his own female; an intruder from another camp is beaten off with their fists and loud yells. If one tries to seize the female of another, he is caught on the ground, and all unite in boxing and biting the offender. A male often carries a child, especially if they are passing from one patch of forest to another over a grassy space; he then gives it to the mother."

The book contains a portrait of a young Soko, which we have reproduced on page 47, and it shows a short-armed, weak-legged, long-eared creature; and in the engraving on page 48, the adults which are being hunted are certainly very much shorter than the natives who are killing them. All that can be said, then, is that possibly the Soko is a kind of Troglodyte, greatly resembling the kind we have next to notice; but its geographical range is most interesting. Its being found so many

THE CHIMPANZEE. (*From a Sketch by Wolf, in the possession of the Zoological Society.*)

hundreds of miles from the Sierra del Crystal, and beyond the woods of the coast-living Chimpanzees, would appear to prove that formerly there was forest and jungle far away to the east, where there are now plains, rivers, and lakes with much forest land.

THE TRUE CHIMPANZEE.*

The name Chimpanzee has sometimes been given to all the great Apes just described, but reference has been made, in considering some points in their anatomy and habits, to a particular animal which bears this name. This one comes next to them in the descending order of the scale of beings, and completes the number of the kinds of these man-shaped Apes of Equatorial Africa. It is the animal, the young of which have frequently been brought to England, where they have been celebrated for their gentle fun, romping play, good climbing, and their ability to imitate many human habits—clothes-wearing, tobacco-smoking, and tea-drinking especially. It is the Chimpanzee of Chimpanzees, the young

* *Troglodytes Niger.*

of which have such very human-looking faces and most baby-like skulls. Being covered for the most part, and especially on the top and sides of the head, with long black hairs, it is called the Black Chimpanzee, or *Troglodytes Niger*.

It was a sight worth seeing to be present in the Monkey House of the Zoological Gardens, in London, when the keeper paid an early morning visit to his attached friend, the Chimpanzee. If he was not quite awake, or lazily inclined, and snugly covered up in his little wooden house, and the keeper called him, a commotion was heard inside, and then a round little figure with a large head came tumbling out, and rushed to the iron wicket. He creeps along at a great rate on all-fours, but the body is half erect, for the fore limbs are long, and the knuckles, or rather the back parts of the second joints of the fingers, are allowed to touch the ground and support the frame in front, whilst the elbows are kept straight. The hind legs, being short, move one after the other as in a canter, and it is readily noticed that although the feet touch the ground on their outer edges they can rest flat on the soles.

There is much joyful recognition, and after he has put his arms around the keeper's neck, he enjoys being tickled and laid on his back in the straw. Making grunts and little laughs, he shows his fine set of teeth, and his fine hazel-coloured eyes twinkle with fun. Then he rushes off, tumbling head over heels, scampers over the straw, and with a jump clasps one of the horizontal wooden bars in the cage, and swings himself up and on to it with an ease and grace which many a gymnast might envy. Running along this, and just balancing himself with the assistance of the back of his hand, he nears a rope, and then, after seizing it, swings with arms out at full length, now catching hold of others or of the wire lattice-work with his feet and toe-thumb, or suddenly coming to the ground with a great bounce. This is usually preparatory to coming to the spectators, and he then squats down, folds his arms, and moves his shoulders from side to side in a quick and restless manner. Another scamper brings him to his house on the ground-floor, into which he looks, and then taking a lot of biscuit, he gives a jump on to its shelving top, sits down, and begins to eat. He sits upright enough, and puts the biscuit into his mouth, but rather clumsily. He does not take it between the tips of his fingers and the thumb, but between the thumb and the side of the first finger, for the thumb is short. Hence, as the food disappears, he appears to be cramming the knuckle of his first finger into his mouth. *

One is struck with the colour of the face, which is nearly hairless, for the tint of its skin is a dirty yellow-ochre; but it is relieved by the beautiful white teeth, the hazel eyes, and the long hair which comes down from the top of the head in front of the ear like a lock. The upper lip has no furrow running down from the small and flat nose, but it is very large, and the mouth looks like a slit in the face when both lips are together. He has distinct eyelids; and when he sits and looks forwards, the chin reaches below the top of the breast and hides the neck. The palm of the hands is flesh-coloured, or darker, and the foot looks very strange, for the hair is long over the ankle and very black, and it ceases suddenly, so that the heel and all the sides and the sole are naked and flesh-tinted. The absence of hair on the face—there being a little straggling beard only—is possibly an ornament, and it is noticed in many Monkeys; but its absence from the under part of the hand and foot, of course, is of use, for it gives a greater power of grasp and a finer sense of touch. The front hair comes to a peak over the forehead, and the curve on either side is as graceful as that of a Queen's Counsel's wig; then it covers a broad low head, which looks very big behind and decidedly over-burdened with two great ears, larger than those of the Gorilla, and which are close neighbours to the high shoulders. Long black hair, with the ears peering through, covers all the back and sides of the head and the wide shoulders and very short neck, and is continued down the back, which shows no sign of a waist, and only becomes smaller just above the thighs. Here, then, is another instance of the frog-like body shape, and it is produced by the same general internal arrangements which have been noticed in the great Apes already described. That is to say, large lungs, and a great stomach and digestive apparatus, are more important than a slim and elegant figure; and good short back-bones, and at least thirteen ribs on either side are more satisfactory possessions in an African forest than long bones and a weak spine.

The arm, fore-arm, and fingers, as a limb, are long, and the tips of the fingers reach just below the knee. This is consistent with the scheme of the construction of the animal, and its adaptation

* This interesting animal died during the publication of this chapter.

for the forest life, which requires the ability to move rapidly and also to climb very easily. The arms are in constant movement when the Chimpanzee is walking, and if they are not assisting in the motion they are uplifted, the head being, moreover, carried a little forward with regard to the body. When the hands clasp a cross-bar, the little use of the small thumb is readily noticed, and the body is allowed to swing, as it were, at the full length of the arms, the thumb not assisting in holding on. But when it climbs a pole, it grasps just like a man under the same circumstances, and the thumb partly encircles the wood. It is very curious to feel the grasp of the hand, and the vigorous squeeze that the foot can give, and to look at the palms and soles. The palms seem very wrinkled across, but not to have a ball under the thumb of any size, and they seem narrow for their length. But although this is the case, and the thumb is short, they assist in grasping very forcibly. All the fingers and the thumbs have flat nails on them, which do not approach the character of a claw, and corresponding nails are found on the feet. All the heel is naked, as if it came through a hole in a stocking of black hair; and as a whole, the foot is shorter than the hand, the third toe being the longest. The toe-thumb is easily movable, and assists in climbing, for it grasps with the aid of the other toes very readily. Like the other large Apes already mentioned, it has no calf, and the legs seem to be too small for it, and to be stuck on to the body by small hips. The roundness behind is wanting, and therefore the muscles which particularly assist in the erect position are not large, as in man.

Yet at first sight there is something very human about the Chimpanzee; it looks like a very old child, and doubtless this is increased by its gentle habits and amiability; and there is every apology to be made for the early geographers and anatomists, who called it the "Pigmie."

One of the first living Chimpanzees which was brought over took some strange dislikes to people. When it was brought on board the ship it would give its hand to be shaken by some, but refused it to others of the sailors with marks of anger, and it speedily became very familiar with the crew, except with a boy, to whom it never became reconciled. When the seamen's mess was brought on deck, it was a constant attendant; it would go round and embrace each person, while it uttered loud yells, and then seated itself to enjoy the repast. If it was pleased at any favourite morsel, or if a piece of sweetmeat was given to it, satisfaction was expressed by a sound like a "hem," in a grave tone; but if it was made angry or vexed, it would bark like a dog or cry like a child, and scratch itself most vehemently. It was active and cheerful in warm latitudes, but it became languid as it left the Torrid Zone, so that a blanket had to be given it as the Channel was reached.

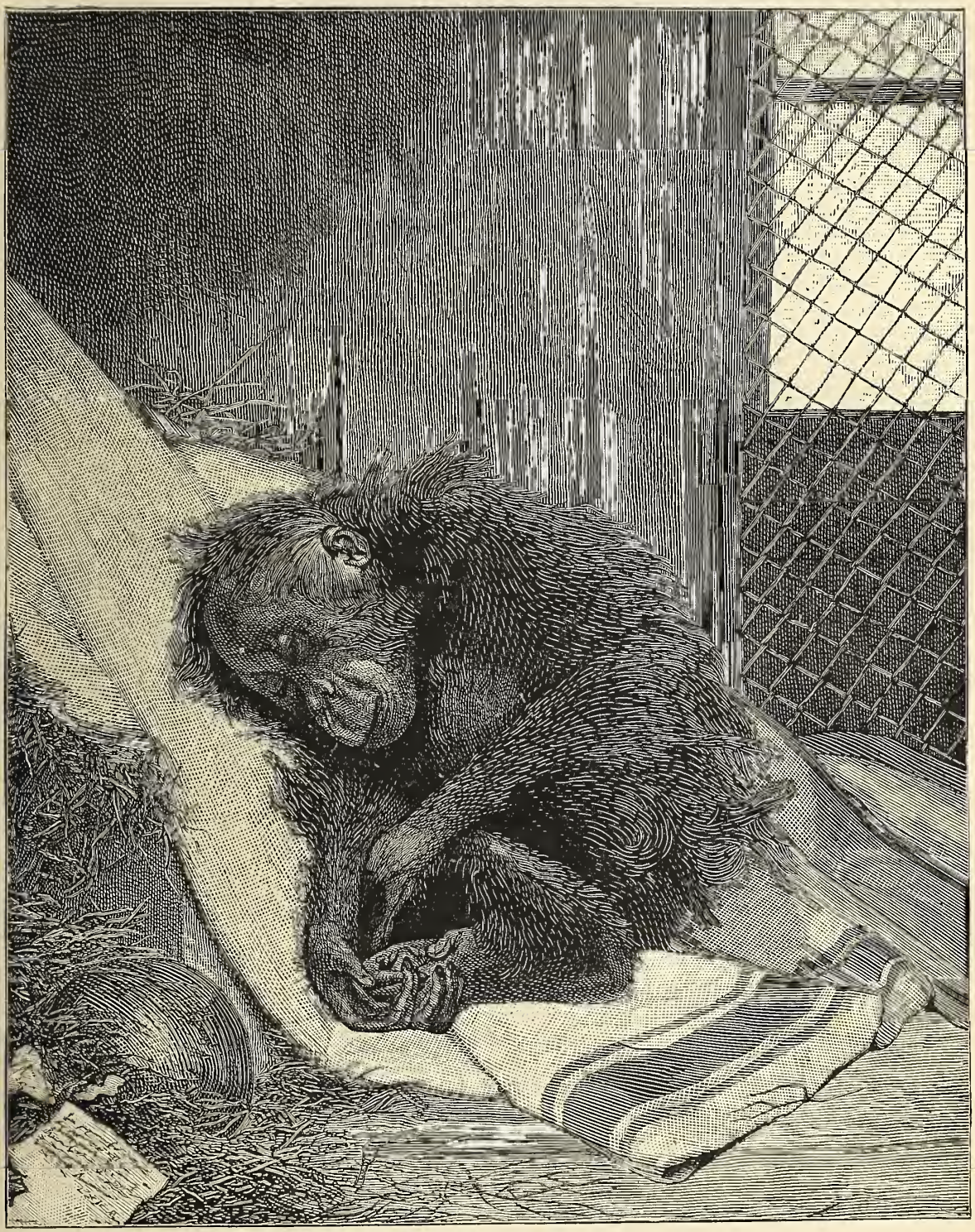
Bamboo, a Chimpanzee, once in the Zoological Society's Gardens, Regent's Park, and the subject of the following sketch, by Lieut. Sayers, "was purchased from a Mandingo, at Sierra Leone, who related that he had captured him in the Bullom country some months before, having first shot the mother, on which occasions the young ones never fail to remain by their wounded parents. On becoming mine, he was delivered over to a black boy, my servant, and in a few days became so attached to him as to be exceedingly troublesome, screaming and throwing himself into the most violent passion if he attempted to leave him for a moment. He evinced also a most strange affection for clothes, never omitting an opportunity of possessing himself of the first garment he came across, whenever he had the means of entering my apartment. He carried it immediately to the piazza, where invariably he seated himself on it with a self-satisfied grunt; nor would he resign it without a hard fight, and, on being worsted, exhibited every symptom of the greatest anger. Observing this strange fancy, I procured him a piece of cotton cloth, which, much to the amusement of all who saw him, he was never without, carrying it with him wherever he went, nor could any temptation induce him to resign it even for a moment. Totally unacquainted with their mode of living in the wild state, I adopted the following method of feeding him, which has appeared to succeed admirably. In the morning, at eight o'clock, he received a piece of bread, about the size of a halfpenny loaf, steeped in water or milk and water; about two, a couple of bananas or plantains; and before he retired for the night, a banana, orange, or slice of pine-apple. The banana appeared to be his favourite fruit; for it he would forsake all other viands, and if not gratified, would exhibit the utmost petulance. On one occasion I deemed it necessary to refuse him one, considering that he had already eaten a sufficiency, upon which he threw himself into the most violent passion, and uttering a piercing cry, knocked his head with such violence against the wall as to throw himself on his back, then ascending a chest which was near, wildly threw his

arms into the air and precipitated himself from it. These actions so alarmed me for his safety that I gave up the contest, and on doing so he evinced the greatest satisfaction at his victory, uttering for several minutes the most expressive grunts and cries; in short, he exhibited, on all occasions when his will was opposed, the impatient temper of a spoilt child; but even in the height of passion I never observed any disposition to bite or otherwise ill-treat his keeper or myself.

"Although he would never object to be caressed or nursed by even a stranger, yet I never saw him evince the slightest disposition to make the acquaintance of any other animal. At the time he came into my possession I had two Patas Monkeys, and thinking they might become acquainted, I

A VILLAGE IN THE GABOON COUNTRY.

placed Mr. Bamboo in the same apartment, where he resided for five months, yet I never saw the least desire on his part to become even friendly; on the contrary, he showed evident anger and dislike at their approach. This strange attachment to the human race, and manifest dislike to all others, I have always considered one of the most extraordinary features of this genus. His cunning was also remarkable. On all occasions when he thought he was unobserved, he would not fail to steal everything within his reach, for no other apparent purpose than to gratify a propensity for thieving; did he, however, even think you were looking at him, he would wait his opportunity with the greatest patience before he commenced depredation. In his habits, unlike the Monkey tribe, he was exceedingly cleanly, never soiling his bed or any place near it; and even on board ship (during the warm weather) he never failed to seek the deck, unassisted, whenever the calls of nature required it. On being left by himself in his piazza he would invariably seat himself on the window-sill, which was the highest point he could



SICK CHIMPANZEE.

attain, and commanded a view of the barrack-yard as well as the interior of my bed-room; but at sunset he would descend, enter a washing-tub, which he had of his own accord chosen as a sleeping-place, and remain there all night; as soon, however, as the sun rose, he would never fail to occupy his favourite position on the window-ledge. From this, I should say, that trees are ascended by the Chimpanzee merely for observation or food, and that they live principally on the ground. Bamboo, at the time of purchase, appeared to be about fourteen months old, and from what I could learn from the natives, they do not reach their full growth till between nine and ten years of age; which, if true, brings them extremely near the human species, as the boy or girl of West Africa, at thirteen or fourteen years old, is quite as much a man or woman as those of nineteen or twenty in our more northern clime. Their height, when full grown, is said to be between four and five feet; indeed, I was credibly informed that a male Chimpanzee, which had been shot in the neighbourhood and brought into Free Town, measured four feet five inches in length, and was so heavy as to form a very fair load for two men, who carried him on a pole between them. The natives say that in their wild state their strength is enormous, and that they have seen them snap boughs off the trees with the greatest apparent ease, which the united strength of two men could scarcely bend. The Chimpanzee is, without doubt, to be found in all the countries, from the banks of the Gambia in the north to the kingdom of Congo in the south, as the natives of all the intermediate parts seem to be perfectly acquainted with them. From my own experience, I can state that the low shores of the Bullom country, situated on the northern shores of the river near Sierra Leone, are infested by them in numbers quite equal to the commonest species of Monkeys. I consider these animals to be gregarious; for when visiting the rice farms of the Chief Dalla Mohammadoo, on the Bullom shore, their cries plainly indicated the vicinity of a troop, as the noise heard could not have been produced by less than eight or ten of them. The natives also affirmed that they always travel in strong bodies, armed with sticks, which they use with much dexterity. They are exceedingly watchful; and the first one who discovers the approach of a stranger utters a protracted cry, much resembling that of a human being in the greatest distress. The first time I heard it I was much startled; the animal was apparently not more than thirty paces distant, but had it been but five I could not have seen it, from the tangled nature of the jungle, and I certainly conceived that such sounds could only have proceeded from a human being, who hoped to gain assistance by his cries from some terrible and instant death. The native who was with me laid his hand upon my shoulder, and pointing suspiciously to the bush, said, 'Massa, Baboo live there!' and in a few minutes the wood appeared alive with them, their cries resembling the barking of dogs. My guide informed me that the cry first heard was to inform the troop of my approach, and that they would all immediately leave the trees, or any exalted situation that might expose them to view, and seek the bush; he also showed evident fear, and entreated me not to proceed any further in that direction. The plantations of bananas, pampaws, and plantains, which the natives usually intermix with their rice, constituting the favourite food of the Chimpanzee, accounts for their being so frequent in the neighbourhood of rice fields. The difficulty of procuring live specimens of this genus arises principally, I should say, from the superstitions of the natives concerning them, who believe they possess the power of 'witching.'"

A most interesting little male Chimpanzee was obtained from the natives of the Gambia coast some years since, and became famous in London for its great intelligence and human-like conduct. His mother was shot when he was about a twelvemonth old, about 120 miles from the sea; and after being well taken care of he was sent to England on board ship, where he had a free range of the rigging and decks, and where he made himself much liked. A distinguished zoologist, Mr. Broderip, visited him in the Zoological Gardens after he had undergone some tuition, and describes what he saw as follows:—

"I saw him for the first time in the kitchen belonging to the keepers' apartments, dressed in a little Guernsey shirt, or banyan jacket. He was sitting child-like in the lap of a good old woman, to whom he clung whenever she made show of putting him down. His aspect was mild and passive, but that of a little withered old man, and his large eyes, hairless and crimpled visage, and man-like ears, surmounted by the black hair of his head, rendered the resemblance very striking, notwithstanding the depressed nose and the projecting mouth. He had already become very fond of his good old nurse, and she had evidently become attached to her nursling, although they had only been acquainted for three or four days, and it was with difficulty that he permitted her to go away to do her work in

another part of the building. On her lap he was perfectly at his ease, and it seemed to me that he considered her as occupying the place of his mother. He was constantly reaching up with his hand to the fold of her neckerchief, though when he did so she checked him, saying, 'No, Tommy, you must not pull the pin out.' When not otherwise occupied, he would sit quietly in her lap, pulling his toes about with his fingers, with the same passive air as a human child exhibits when amusing himself in the same manner. I wished to examine his teeth; and when his nurse, in order to make him open his mouth, threw him back in her arm and tickled him just as she would a child, the caricature was complete.

"I offered him my ungloved hand. He took it mildly in his, with a manner equally exempt from forwardness and fear, examined it with his eyes, and perceiving a ring on one of my fingers, submitted that, and that only, to a very cautious and gentle examination with his teeth, so as not to leave any mark on the ring. I then offered him my other hand with the glove on. This he felt, looked at it, turned it about, and then tried it with his teeth. At length it became necessary for his kind nurse to leave him, and after much remonstrance on his part she put him on the floor. He would not leave her, however, and walked nearly erect by her side, holding by her gown just like a child. At last she got him away by offering him a peeled raw potato, which he ate with great relish, holding it in his right hand. His keeper, who is very attentive to him, then made his appearance, and spoke to him. Tommy evidently made an attempt to speak, gesticulating as he stood erect, protruding his lips, and making a hoarse noise like 'hoo! hoo!' He soon showed a disposition to play with me, jumping on his lower extremities opposite to me like a child, and looking at me with an expression indicating a wish for a game at romps. I confess I complied, and a capital game we had. On another occasion, and when he had become familiar with me, I caused, in the midst of his play, a looking-glass to be brought and held before him. His attention was constantly and strongly arrested: from the utmost activity he became immovably fixed, steadfastly gazing at the mirror with eagerness, and something like wonder depicted in his face. He at length looked up at me, then again gazed at the glass. The tips of my fingers appeared on one side as I held it; he put his hands and then his lips to them, then looked behind the glass, and finally passed his hands behind it, evidently to feel if there were anything substantial there. I presented him with a cocoa-nut, to the shell of which some bark was still adhering; the tender bud was just beginning to shoot forth—this he immediately bit off and ate. He then stripped off some of the bark with his teeth, moving it by the crust of adhering fibres round his head, darted it down, and repeatedly jumped on it with all his weight. A hole was bored in one of the eyes, and the nut again given to him, and he immediately held it up with the aperture downwards, applied his mouth to it, and sucked away at what milk there was with great glee. As I was making notes with a paper and pencil, he came up and looked at me inquisitively, testing the pencil with his teeth when he had it given to him. A trial was made of the little fellow's courage; for when his attention was directed elsewhere, a hamper containing a large snake, called Python, was brought in and placed on a chair near the dresser. The lid was raised, and the basket in which the snake was enveloped was opened, and soon after Tommy came gamboling that way. As he jumped and danced along the dresser towards the basket he was all gaiety and life; suddenly he seemed to be taken aback, stopped, and cautiously advanced towards the basket, peered or rather craned over it, and constantly, with a gesture of horror and aversion and the cry of 'hoo! hoo!' recoiled from the detested object, jumped back as far as he could, and then sprang to his keeper for protection. Tommy does not like confinement, and when he is shut up in his cage, the violence with which he pulls at and shakes the door is very great, and shows considerable strength; but I have never seen him use this exertion against any other part of the cage, though his keeper has endeavoured to induce him to do so, in order to see whether he would make the distinction. When at liberty he is extremely playful; and in his high jinks, I saw him toddle into a corner where an unlucky bitch was lying with a litter of very young pups, and lay hold of one of them, till the snarling of the mother and the cries of the keeper made him put the pup down. He then climbed up to the top of the cage where the Marmosets were, and jumped furiously upon it, evidently to astonish the inmates, who huddled together, looking up at the dreadful creature over their heads. Then he went to a window, opened it and looked out. I was afraid that he might make his escape; but the words 'Tommy, No!' pronounced by the keeper in a mild but firm tone, caused him to shut the window and to come away. He is, in truth, a most docile

and affectionate animal, and it is impossible not to be taken with the expressive gestures and looks with which he courts your good opinion, and throws himself upon you for protection against annoyance."

Whether they grow cross and savage as they get old is not known, for no adults have been kept in captivity, but as this is usual in other Monkeys, it is probable that their interesting time of life is that of childhood, and that when the age of fun and tricks has passed there is not much else but brutality left.

Little or nothing reliable is known about the habits of the adults, and all the wickednesses of Gorillas and Baboons have been attributed to them, and, in fact, the very same stories will do for any one of them.

These stories have, however been believed; and even Cuvier, the great comparative anatomist, wrote, that the Chimpanzees live in troops, construct themselves huts of leaves, arm themselves with sticks and stones, and employ these weapons to drive away men and Elephants from their dwellings. They did not, he believed, scruple to attack the Lion, and they were exceedingly impolite to negresses in general.

As they all, except possibly the Soko, live in a district, where the forests are dense and close, there is no doubt they are rarely seen; and indeed reliable travellers do not hesitate to say that a white man has never seen them in a state of nature, except by obtaining a glance as they rush off on being surprised. All the stories must, therefore, be received with suspicion, as tainted with the results of African fear and love of the wonderful; especially as they come from the negro race living in the great country, which may be said to extend along the West Coast from the river Gambia to some distance north of Angola, and thence inland to the unknown country between the hills which run parallel with the sea many miles inland, and the country of the great lakes far away to the East.

Gifted with wonderful agility and no little power of imitation and intelligence, and possessed of very acute senses and ability to unite the actions of many groups of muscles to a common purpose, the Chimpanzee must have a well-formed nervous system—that is to say, a good brain and spinal cord. A brain to originate or commence actions, and the cord of nerves to carry the orders of the brain to the limbs. Measured over the brain case of the skull, that of the Chimpanzee has a bulk of about one-half of that of man, and less than that of the Gorilla; but the brain itself has striking resemblances with that of man. The principal folds which are noticed on the human brain exist in the Chimpanzee, but they are simpler in their foldings, and are large in proportion to the whole. This means that there is not as much nerve structure packed in a given space as there is in man; and the distinction is most important, for the greater the packing the greater the nervous energy and power.* But the parts of the brain which have especially to do with the movements of the body, and their regulations and adaptations, are very well formed; and it is the comparative deficiency in those parts which have a mysterious relation with the intelligence, instinct, and the mind which causes the brain of the Chimpanzee to differ in appearance and size from that of man. But in both the brain proper over-laps and covers the cerebellum or little brain. The nerves are well formed and large.

It seems that the brain of the Chimpanzee never has a chance of increasing in size, for after a certain age the bones of the brain case become, as it were, soldered together.

The Chimpanzee has a famous pair of shoulders, a broad back, and, like the Gorilla, a very short neck. Its weight is less than that of the greatest of Apes, and therefore it does not require such huge muscles for climbing. The great bony spines of the neck-bones are smaller; and the bones of the upper part of the spine are not made as strongly.

Loving much to hang by the hands, with the arms stretched out above the head, the Chimpanzee has the blade-bone more like that of an ordinary Monkey, and less like man and the Gorilla, and its muscles are so placed as to permit of their acting readily when this curious position is kept up. As this position is extremely easy and useful, it is assisted by the animal's having a short and stout collar-bone. Its arm-bone is tolerably near the length of that of man, but it is like a Gorilla's in miniature. The bones of the fore-arm (the radius and ulna), instead of being shorter than the arm-bone, equal it in length, and the last named is much bent, so as to give a large surface for the muscles which supply the hand and wrist.

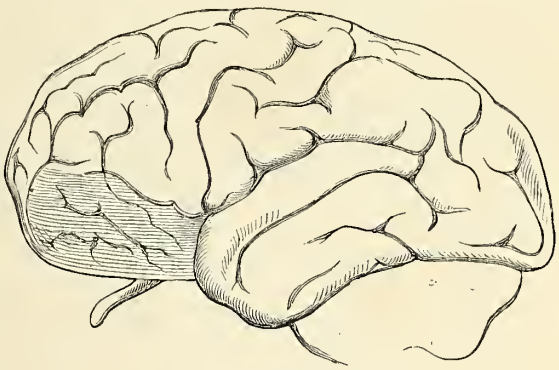
As a whole, the hand of the Chimpanzee is, in proportion to the size of the animal, larger than

* See Introduction.

that of the Gorilla, but the thumb is shorter, and this makes it more monkey-like than human; and the same may be said of the lower limbs, for the thigh-bone and those of the leg, although greatly resembling those of the Gorilla, have many peculiarities which make them resemble those of the less important Monkeys. Finally, with regard to the foot, that of the Chimpanzee is more monkeyish than that of the Gorilla. The great Ape's foot has many peculiarities which make it to differ from that of man, and these are all magnified, as it were, in the Chimpanzee, whose foot, therefore, is all the more unlike ours. It is especially adapted for grasping and climbing, and less well suited for occasionally standing erect and walking. Its heel is short and slender, and the toe-thumb is smaller, and the whole foot is slenderer, than the Gorilla's. Moreover, it is more turned in.

When young, there are no crests on the head, but with age a small one grows on either side in front, running from about the centre of each side of the brow ridge over the receding forehead, and joining together in the middle line, close to the top of the skull. This meets a larger and stronger one, which is a miniature of the head crest of the Gorilla, and which reaches from ear to ear. The use is probably for the attachment of the masticating muscles at the side, and for that of the muscles of the neck behind; but it is also a kind of ornament of the males.

Strong as this Ape is in its loins, from its extra ribs, the hip-bones seem narrow from side to side; and one of the causes of this is interesting, not only because it is also noticed in the other great Apes, but also because it is one of their great distinctions from man.



BRAIN OF CHIMPANZEE.

The pieces of the back-bone (or vertebræ), as they pass between the hip-bones behind, unite them together, and degenerate until they form the curious little tail-end of the back-bone, which in us, and in the Apes, is curled slightly, with the concave part of the bend forward. The pieces unite strongly to each other above and below, and form really one bone, which is called the sacrum. Now, if these pieces were nearly or quite as stout and broad as those higher up, the hips would be wide apart; but if they become narrow, the hips will be all the closer together. In man, the pieces are broad, and the sacrum, as a whole, is so also, and the hips are widely separate; but the reverse is the case in the Apes.

This difference in the breadth of the bone and the width of the hip has evidently to do with the maintenance of the erect posture in man, and the inability to keep erect for long, and comfortably, by these great Apes. The larger the surface of the sacrum, the greater is the mass of muscle passing to the back and downwards; and this is small in comparison in the Chimpanzee.

Where the proper vertebræ of the sacrum end—that is to say, the pieces of the back-bone which are placed between the hip (ilium) bones—the tail begins. It is made up of three stunted bones, which are something like ill-made back-bone pieces (vertebræ); they are usually inseparably joined together to make a special bone, which is broad above, and tapering below. This bone, the rudiment of the tail, which, from some fancied resemblance to a Cuckoo's back, has been called the cuckoo-bone (*os coccygis*), is covered by skin and embedded in muscles, which do not allow it to stick out visibly even as a stump; for its tip is curled inwards. This apology for the member which is so vastly important in many Monkeys is narrow in the man-like Apes, the black Chimpanzee included; but it is a little wider in man, although the general construction is the same. Could these bones—which, by their being united, form this rudiment of a tail—be disunited and increased in number, stuck out, and covered with skin and muscles, something like the very monkey-like appendage would be formed. But noble tails are not the gifts of the higher Apes, as they are called, from their many points of resemblance in structure with man, and even in the smaller Monkeys they are extremely variable belongings, being given to one kind and not to another in a manner far beyond our philosophy.

The Chimpanzee has a long palate, like the other great Apes of the West African woods,

Moreover, it has a uvula in the back of the throat, and the back of the tongue is marked with great papillæ, which take up the shape of a T. It does not do more than grunt "hem," and bark after a fashion; and the use of some great air-pouches, which resemble those of the Gorilla, are therefore not very apparent. But the bony structures of the palate are interesting, for at the back of it they do not form a simple knob, as in the Gorilla, but resemble those of man, and there is a little prominence, with a festoon curve on either side.

It lives upon vegetable food, and its teeth are admirably suited for it; they are of the same number as those of the rest of the great man-shaped Apes, and do not differ very much from them. The front teeth are large, and project, and do not bite very up and down on the tips, so they wear behind quicker than in front, their general shape being rather peculiar and distinctive. Female Chimpanzees have smaller eye teeth than the males, and all have them with a sharp edge behind, so that they can cut a pine-apple as well as pierce it. Behind them are the "pre" and true molars, but the last tooth of the upper jaw looks small, for its hinder projections or cusps are small. In the lower jaw the last tooth has a fifth cusp, but it is smaller proportionately than in the lower Monkeys; and the first "pre" molar has its front and outer angle stuck out very much after the fashion of the Baboons. Now these are little matters, which do not appear to have anything to do with causes and effects, the adaptation of means to ends, or which do not enable the creature to chew and crush its food a bit the less well, or better than others; they refer to some hidden mystery which unites apparently very different animals together in the scheme of creation. Thus the Chimpanzee has human-like, gorilla-like, baboon-like, and other monkey-like peculiarities, so far as the teeth are concerned, and yet which do not interfere with the successful mastication of the food. We may make theories about them of supreme interest, which may explain why animals are alike and unlike, and how the superior animals' structures were foreshadowed in lower ones, and those of these in still simpler forms of life.

It is the great front teeth, the large space hidden by the visible nose, the prominent upper, and the great length of the lower jaw, which give such a baboon-like appearance to the face of the Chimpanzee's skull; and this is interesting, for there may have been a kinship between the two tribes, as will be noticed further on.

These man-shaped Apes, the Gorilla, the Nschiego Mbouvé, the Koolo-Kamba, the Soko, and the Chimpanzee, form a group of beings which is peculiarly situated geographically, and which is separated from all others by anatomical differences. Their home is in Equatorial Africa, from the Western Sea to the Great Lakes near the eastern side of the Continent, and none of the kinds composing it have ever been found out of this range. Their bones have not been found in caves or in the state of fossils anywhere, so they must be regarded as essentially African. The group clings to forest and jungle, and its members lead very much the same kind of lives, for they are all vegetarians, liking quietude, and either roaming singly or in pairs, or living in troops. There is no evidence whatever that any of these species of Troglodytes have ever wandered; and it must be admitted that they have lived where they are now found ever since the country has been as it is, as regards its physical geography and peculiar climate. As regards their anatomical distinctness from other beings, they may be separated from man on the one hand, and from the Monkeys, which form the subject of the next chapters, on the other. They are linked together as a group by many resemblances in their construction, although there are differences enough to distinguish kind from kind. From man they one and all differ in the shape of the head, the size of the brain case, the nature of the palate, the shape of the jaws, and in the last lower molar teeth and tooth-spaces. Their head-ridges, the shape and length of their limbs, and the nature of their thumbs and toe-thumbs are very distinctive. The great air-pouches, the shape of the chest, the extra ribs, and the shape of the hip-girdle, cause them to differ much from man; and their brain is, as it were, dwarfed and infantile.*

* They have several muscular peculiarities. Thus the great muscle of the hind part of the loins (Sacro lombalis) is vast and fleshy in man, but it is reduced to very small proportions in the great Apes. The great oblique muscle of the body is not attached to the hip, and the muscles of the buttocks are reduced excessively in the Apes. All this renders their erect position difficult and not usual. The motions of the shoulder and arms are assisted by extra muscles; one stretches from the sixth neck-vertebræ to the first rib, another reaches from the outer part of the collar-bone to the neck in front, to the bone under the tongue (hyoid bone), and a third from the collar-bone to the side of the first vertebra. The small muscle of the chest (pectoralis minor) reaches to the capsule which surrounds the shoulder-joint. There is an extra muscle, which

CHAPTER III.

THE MAN-SHAPED APES (*continued*)—Genus *Simia*—THE ORANG-UTAN.

Origin of the Name—Description of the Orang—Rajah Brooke's First Specimen—Mr. Wallace's Experiences in Mias Hunting—The Home of the Mias—A Mias at Bay—Their Nests, Habits, Food, and Localities—Different kinds of Orangs—Structural Points—The Intelligence and Habits of the Young—The Brain and its Case—Resemblances and Differences of Old and Young.

THE ORANG-OUTAN.*

THE Malays call their chiefs Orangs, and the word relates to the intelligence of those called by it, meaning "a rational being." They apply it also to their Elephants, and to the great Ape of Sumatra and Borneo. Utan, or as some spell it, Oetan (utang being wrong), means wild, or "of the woods;" and hence the conjoined words may be translated by what the natives really mean, "the wild man of the wood." There are two kinds of Orang-utan, and both are, to a certain extent, man-like, the resemblance being greatest in the females and in the young, and diminishing as the males grow older.

All have long ruddy-brown hair, the tinge being decidedly red, a dark face, with small eyes, small nose, and great projecting jaws. The hair comes over the forehead and backwards over the neck; it is long on the limbs, and points downwards on the upper and upwards on the lower arm. It covers the back, and seat, and legs, standing out often, and gives a very wiry look to the fur. What strikes one directly on looking at a well-stuffed specimen of an old male, for instance, is the great length of the fore-limbs, which reach far towards the ankle, the length of the muzzle, and the extraordinary breadth of the face under the eyes, where the flatness resembles a mask more than a natural growth. In the females and young this growth of the cheek-bone and its covering of fat and skin are not seen; and it appears to be a mark of male beauty, as are also two sets of ridges on the skull, which greatly resemble those of the Gorilla.

Rajah Brooke, whose name will always be associated with Borneo, took great interest in Orang-utan hunting, principally with a view to decide how many kinds there were; and his first impressions on killing his first large one were excited by the prominent peculiarities just noticed. The first male he killed was seated lazily on a tree, and when the people approached he only took the trouble to hide behind the trunk, peeping first on one side and then on the other, and "dodging," as the Rajah did the same. He was wounded in the wrist, and afterwards was despatched. The Rajah wrote to the Zoological Society of London as follows:—"Great was our triumph as we gazed on the huge animal dead at our feet, and proud were we of having shot the first Orang we had seen, and shot him in his native woods, in a Borneo forest hitherto untrodden by European feet. We were struck with the length of his arms, the enormous neck, the expanse of face, which altogether gave the impression of great height, whereas it was only great power. The hair was long, reddish, and thin; the face remarkably broad and fleshy, and on each side, in the place of a man's whiskers, were the callosities, or rather fleshy protuberances, which I was so desirous to see, and which were nearly two inches in thickness. The ears were small and well shaped, the nose quite flat, the mouth prominent, the lips thick, the eyes small and roundish, the teeth large and discoloured, the face and hands black—these last being very powerful. This animal was four feet one inch in height, and its fore-limb was three feet five inches and three-quarters in length; the width of the face, moreover, being as much as one foot one inch."

"Whilst the fore-limb was so long, the lower limb, from the hip to the heel, only measured one foot nine inches; and hence there is great disproportion between the limbs, the legs and feet appearing dwarfed in comparison."

The Rajah considered the Orangs to be as dull and slothful as one could conceive, and on no

reaches from the back to the elbow, and which allows the animals, when hanging by one hand, to turn and twist the body slightly. The metacarpal bone of the little finger has a special muscle, which tends to enlarge the grasp of the hand. The great Apes have, however, an imperfect or deficient proper flexor to the thumb, and the extensor of the first joint of the thumb is wanting. The ill-developed "calf" has not its two great muscles combined in the one tendo Achillis, as in man, and the muscles of the foot are so arranged that they permit of much more independent motion than those of man have.

* *Simia Satyrus. Simia Morio.*

occasion, when pursuing them, did they move so fast as to preclude his keeping pace with them easily through a moderately clear forest, and even when obstructions below (such as wading up to the neck) enabled them to get away some distance, they were sure to stop and allow the hunters to come up. He never observed any attempt at defiance; and the wood which sometimes rattled about his ears was broken by their weight, and not thrown down, as some people imagine to be the case.

If pushed to extremity, the large male with crests on its head, and (which is called "Pappan") could be formidable; and one unfortunate man, who, with a party, was trying to catch a large one alive, lost two of his fingers, besides being severely bitten in the face, whilst the animal finally beat off its pursuers. When the natives wish to catch an adult, they cut down a circle of trees round the one on which he is seated, and then fell that also, and close before he can recover himself, and try to bind him. He also notices the little dread the natives have of them, and that they form seats rather than nests in the trees.

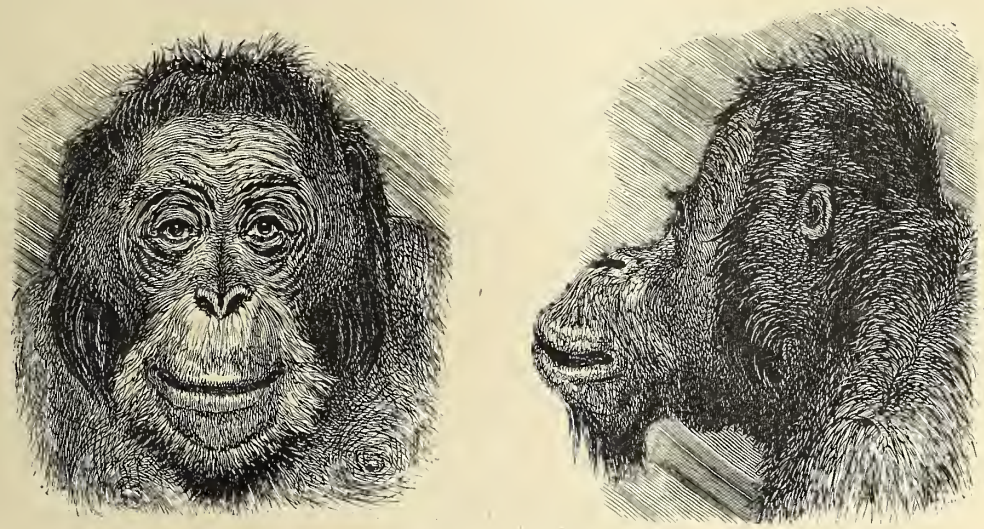
These observations regarding their habits have been slightly opposed by Mr. Wallace, whose descriptions of Orang—or, as he prefers to call it, from the Dyak language, Mias hunting—and of their habits, are undoubtedly the most reliable.

He spent a long time in the great islands of Borneo, Java, and Sumatra; and one of his principal objects in visiting the first especially was to obtain an insight as to the nature and life of the great man-like Apes of the country. After some time spent in hunting, he succeeded in shooting a full-grown male Orang-utan, and he describes the scene as follows:—

"I had just come home from an entomologising excursion, when Charles rushed in, out of breath with running and excitement, and exclaimed, interrupted by gasps, 'Get the gun, sir—be quick—such a large Mias!' 'Where is it?' I asked, taking hold of my gun as I spoke, which happened luckily to have one barrel loaded with ball. 'Close by, sir—on the path to the mines; he can't get away.' Two Dyaks chanced to be in the house at the time, so I called them to accompany me, and started off, telling Charley to bring all the ammunition after me as soon as possible. The path from our clearing to the mines led along the side of the hill, a little way up its slope, and parallel with it at the foot a wide opening had been made for a road, in which several Chinamen were working, so that the animal could not escape into the swampy forest below without descending to cross the road, or ascending to get round the clearing. We walked cautiously along, not making the least noise, and listening attentively for any sound which might betray the presence of the Mias, stopping at intervals to gaze upwards. Charley soon joined us at the place where he had seen the creature, and having taken the ammunition, and put a bullet in the other barrel, we dispersed a little, feeling sure that it must be somewhere near, as it had probably descended the hill, and would not be likely to return again. After a short time I heard a very slight rustling sound overhead, but on gazing up could see nothing. I moved about in every direction, to get a full view into every part of the tree under which I had been standing, when I again heard the same noise, but louder, and saw the leaves shaking, as if caused by the motion of some heavy animal, which moved off to an adjoining tree. I immediately shouted for all of them to come up and try and get a view, so as to allow me to have a shot. This was not an easy matter, as the Mias had a knack of selecting places with dense foliage beneath. Very soon, however, one of the Dyaks called me and pointed upwards, and on looking I saw a great red hairy body and a huge black face gazing down from a great height, as if wanting to know what was making such a disturbance below. I instantly fired, and he made off at once, so that I could not then tell whether I had hit him. He now moved very rapidly and very noiselessly for so large an animal, so I told the Dyaks to follow and keep him in sight while I loaded. The jungle was here full of large angular fragments of rock from the mountain above, and thick with hanging and twisting creepers. Running, climbing, and creeping among these, we came up with the creature on the top of a high tree near the road, where the Chinamen had discovered him, and were shouting their astonishment with open mouth: 'Ya, ya, Tuan! Orang-utan, Tuan!' Seeing that he could not pass here without descending, he turned up again towards the hill, and I got two shots, and following quickly had two more by the time he had again reached the path; but he was almost more or less concealed by foliage, and protected by the large branch on which he was walking. Once while loading I had a splendid view of him, moving along a large limb of a tree in a semi-erect posture, and showing him to be an animal of the largest size. At the path he got on to one of the loftiest trees in the forest, and we could see one

ORANG UTANS.

leg hanging down useless, having been broken by a ball. He now fixed himself in a fork, where he was hidden by thick foliage, and seemed disinclined to move. I was afraid he would remain and die in this position, and as it was nearly evening I could not have got the tree cut down that day. I therefore fired again, and he then moved off, and going up the hill was obliged to get on to some lower trees, on the branches of one of which he fixed himself in such a position that he could not fall, and lay all in a heap, as if dead or dying. I now wanted the Dyaks to go up and cut off the branch he was resting on, but they were afraid, saying he was not dead, and would come and attack them. We then shook the adjoining tree, pulled the hanging creepers, and did all we could to disturb him, but without effect; so I thought it best to send for two Chinamen with axes to cut down the tree. While the messenger was gone, however, one of the Dyaks took courage and climbed towards him, but the Mias did not wait for him to get near, moving off to another tree, where he got on to a dense mass of branches and creepers, which almost completely hid him from our view. The tree was luckily a small one, so when the axes came we soon had it cut through; but it was so held up by jungle ropes and climbers to adjoining trees that it only fell into a sloping position. The Mias did not move, and I



FRONT AND SIDE FACE OF THE ORANG.

began to fear that, after all, we should not get him, as it was near evening, and half-a-dozen more trees would have to be cut down before the one he was on would fall. As a last resource we all began pulling at the creepers, which shook the tree very much; and, after a few minutes, when we had almost given up all hopes, down he came with a crash and a thud like the fall of a giant. And he was a giant, his head and body being full as large as a man's. He was of the kind called by the Dyaks 'Mias Chapyian,' or 'Mias Pappan,' which has the skin of the face broadened out to a ridge or fold at each side. His outstretched arms measured seven feet three inches across, and his height, measuring fairly from the top of the head to the heel, was four feet two inches. The body just below the arms was three feet two inches round, and was quite as long as a man's, the legs being exceedingly short in proportion. On examination we found he had been dreadfully wounded. Both legs were broken, one hip-joint and the root of the spine completely shattered, and two bullets were found flattened in his neck and jaws; yet he was still alive when he fell. The two Chinamen carried him home tied to a pole; and I was occupied with Charley the whole of the next day, preparing the skin and boiling the bones, to make a perfect skeleton, which are now preserved in the museum at Derby."

The following description from the same author gives an excellent idea of the nature of the country inhabited by another Orang, and of its Monkey companions:—

"After a few miles, the stream became very narrow and winding, and the whole country on each side was flooded. On the banks were abundance of Monkeys—the common *Macacus cynomolgus*, a black *Semnopithecus*, and the extraordinary Long-nosed Monkey (*Nasalis larvatus*), which is as large

as a three-year-old child, has a very long tail, and a fleshy nose, longer than that of the biggest-nosed man. The further we went on the narrower and more winding the stream became; fallen trees sometimes blocked up our passage, and sometimes tangled branches and creepers met completely across it, and had to be cut away before we could get on. It took us two days to reach Semábanga, and we hardly saw a bit of dry land all the way. In the latter part of the journey I could touch the bushes on each side for miles; and we were often delayed by the screw-pines (*Pandonus*) which grew abundantly in the water, falling across the stream. In other places dense rafts of floating grass completely filled up the channel, making our journey a constant succession of difficulties. The mountain or hill was close by, covered with a complete forest of fruit-trees, among which the Durion and Mangosteen were very abundant; but the fruit was not yet quite ripe, except a little here and there. I spent a week at this place, going out every day in various directions about the mountain, accompanied by a Malay, who had stayed with me while the other boatmen returned. For three days we found no Orangs, but shot a Deer and several Monkeys. On the fourth day, however, we found a Mias feeding on a very lofty Durion tree, and succeeded in killing it, after eight shots. Unfortunately it remained in the tree, hanging by its hands, and we were obliged to leave it and return home, as it was several miles off. As I felt pretty sure it would fall during the night, I returned to the place early the next morning, and found it on the ground beneath the tree. To my astonishment and pleasure, it appeared to be a different kind from any I had yet seen; for although a full-grown male, by its fully-developed teeth and very large canines, it had no sign of the lateral protuberance on the face, and was about one-tenth smaller than the other adult males. The upper incisors, however, appeared to be broader than in the larger species, a character distinguishing the *Simia morio* of Professor Owen, which he has described from the skull of a female specimen. As it was too far to carry the animal home, I set to work and skinned the body on the spot, leaving the head, hands, and feet attached, to be finished at home. This specimen is now in the British Museum."

The Mias, as stated by Rajah Brooke, will turn upon an antagonist when hard pressed, and with no small bravery and ferocity; and this was satisfactorily proved by Mr. Wallace, who tells the following story:—

"About ten days after this, on June 4th, some Dyaks came to tell me that the day before a Mias had nearly killed one of their companions. A few miles down the river there is a Dyak house, and the inhabitants saw a large Orang feeding on the young shoots of a palm by the river side. On being alarmed he retreated towards the jungle, which was close by, and a number of the men, armed with spears and choppers, ran out to intercept him. The man who was in front tried to run his spear through the animal's body, but the Mias seized it in his hands, and in an instant got hold of the man's arm, which he seized in his mouth, making his teeth meet in the flesh above the elbow, which he tore and lacerated in a dreadful manner. Had not the others been close behind, the man would have been more seriously injured, if not killed, as he was quite powerless; but they soon destroyed the creature with their spears and choppers. The man remained ill for a long time, and never fully recovered the use of his arm. They told me the dead Mias was still lying where it had been killed, so I offered them a reward to bring it up to our landing-place immediately, which they promised to do. They did not come, however, till the next day, and then decomposition had commenced, and great patches of the hair came off, so that it was useless to skin it. This I regretted much, as it was a very fine full-grown male. I cut off the head and took it home to clean, while I got my men to make a close fence, about five feet high, round the rest of the body, which would soon be devoured by maggots, small lizards, and ants, leaving me the skeleton."

On another occasion Mr. Wallace had an opportunity of observing the nest, or rather nest-making, which is performed by these animals when severely wounded. "He was called by a Chinaman working in Borneo to shoot a Mias which, he said, was on a tree close by his house at the coal-mines. Arriving at the place, we had some difficulty in finding the animal, as he had gone off into the jungle, which was very rocky and difficult to traverse. At last we found him up a very high tree, and could see that he was a male of the largest size. As soon as I had fired, he moved higher up the tree, and while he was doing so I fired again; and we then saw that one arm was broken. He had now reached the very highest part of an immense tree, and immediately began breaking off boughs all around, and laying them across and across to make a nest. It was very interesting to see how well

he had chosen his place, and how rapidly he stretched out his unwounded arm in every direction, breaking off good-sized boughs with the greatest ease, and laying them back across each other, so that in a few minutes he had formed a compact mass of foliage, which entirely concealed him from our sight. He was evidently going to pass the night here, and would probably get away early the next morning, if not wounded too severely. I therefore fired again several times, in hopes of making him leave his nest; but, though I felt sure I had hit him, as at each shot he moved a little, he would not go away. At length he raised himself up, so that half his body was visible, and then gradually sank down, his head alone remaining on the edge of the nest. I now felt sure he was dead, and tried to persuade the Chinaman and his companion to cut down the tree; but it was a very large one, and they had been at work all day, and nothing would induce them to attempt it. The next morning, at daybreak, I came to the place, and found that the Mias was evidently dead, as his head was visible in exactly the same position as before."

There is every reason to believe that the Mias, or Orang-utan, is confined to the two great islands of Sumatra and Borneo, in the former of which, however, it seems to be much more rare. In Borneo it has a wide range, inhabiting many districts on the south-west, south-east, north-east, and north-west coasts, but appears to be chiefly confined to the low and swampy forests. It seems, at first sight, very inexplicable that the Mias should be quite unknown in the Saráwak valley, while it is abundant in Sambas, on the west, and Sádong, on the east; but when we know the habits and mode of life of the animal, we see a sufficient reason for this apparent anomaly in the physical features of the Saráwak district. Where Mr. Wallace observed the Mias it was where the country is low, level, and swampy, and at the same time covered with a lofty virgin forest. Many isolated mountains, on some of which the Dyaks have settled, are close by, and are covered with plantations of fruit-trees. These are a great attraction to the Mias, which comes to feed on the fruits, but always retires to the swamp at night. When the country becomes slightly elevated, and the soil dry, the Mias is no longer to be found. For example, in all the lower parts of the Sádong valley it abounds, but as soon as we ascend above the limits of the tides, where the country, though still flat, is high enough to be dry, it disappears. Now, the Saráwak valley has this peculiarity: the lower portion, though swampy, is not covered with continuous lofty forests, but is principally occupied by the Nipa palm; and near the town of Saráwak, where the country becomes dry, it is greatly undulated in many parts, and covered with small patches of virgin forest and much second-growth jungle, on ground which has once been cultivated by the Malays or Dyaks. "Now it seems to me," writes the same author, "that a wide extent of unbroken and equally lofty virgin forest is necessary to the comfortable existence of these animals. Such forests form their open country, where they can roam in every direction, with as much facility as the Indian on the prairie or the Arab on the desert; passing from tree-top to tree-top without ever being obliged to descend upon the earth. The elevated and the drier districts are more frequented by man, and are more cut up by clearings and low second-growth jungle. They are not adapted to its peculiar mode of progression, and they would be more exposed to danger, and more frequently obliged to descend upon the earth in such places. There is probably also a greater variety of fruit in the Mias district, the small mountains which rise like islands out of it serving as a sort of gardens or plantations. It is a singular and very interesting sight to watch a Mias making his way leisurely through the forest. He walks deliberately along some of the larger branches in the semi-erect attitude, which the great length of his arms and the shortness of his legs cause him naturally to assume; and the disproportion between these limbs is increased by his walking on his knuckles, not on the palm of the hand, as we should do. He seems always to choose those branches which intermingle with an adjoining tree, on approaching which he stretches out his long arms, and seizing the opposing boughs, grasps them together with both hands, seems to try their strength, and then deliberately swings himself across to the next branch, on which he walks along as before. He never jumps or springs, or even appears to hurry himself, and yet manages to get along almost as quickly as a person can run through the forest beneath. The long and powerful arms are of the greatest use to the animal, enabling it to climb easily up the loftiest trees, to seize fruits and young leaves from slender boughs which will not bear its weight, and to gather leaves and branches with which to form its nest."

Mr. Wallace, who described how it forms a nest when wounded, states "that it uses a similar one to sleep in almost every night. This is placed low down, however, on a small tree, not more than from

THE ORANG AT BAY.

twenty to fifty feet from the ground, probably because it is warmer and less exposed to wind than higher up. Each Mias is said to make a fresh one for himself every night; but I should think that is hardly probable, or their remains would be much more abundant; for though I saw several about the coal-mines, there must have been many Orangs about every day, and in a year their deserted nests would become very numerous. The Dyaks say that when it is very wet the Mias covers himself over with leaves of Pandanus, or large ferns, which has, perhaps, led to the story of his making a hut in the trees. The Orang does not leave his bed till the sun has well risen and has dried up the dew upon the leaves. He feeds all through the middle of the day, but seldom returns to the same tree two days running. They do not seem much alarmed at man, as they often stared down upon me for several

A FAMILY OF ORANG-UTANS.

minutes, and they only moved away slowly to an adjacent tree. After seeing one, I have often had to go half a mile or more to fetch my gun, and in nearly every case have found it on the same tree, or within a hundred yards, when I returned. I never saw two full-grown animals together, but both males and females are sometimes accompanied by half-grown young ones, while, at other times, three or four young ones were seen in company. Their food consists almost exclusively of fruit, with occasional leaves, buds, and young shoots. They seem to prefer unripe fruits, some of which were very sour, others intensely bitter, particularly the large red fleshy arillus, or rind of one, which seemed an especial favourite. In other cases they eat only the small seed of a large fruit, and they almost always waste and destroy more than they eat, so that there is a continual rain of rejected portions below the tree they are feeding on. The Durion is an especial favourite, and quantities of this delicious fruit are destroyed wherever it grows surrounded by forest, but they will not cross clearings to get at them. It seems wonderful how the animal can tear open this fruit, the outer covering of which is so

thick and tough, and closely covered with strong conical spines. It probably bites off a few of these first, and then, making a small hole, tears open the fruit with its powerful fingers. The Mias rarely descends to the ground, except when, pressed by hunger, it seeks for succulent shoots by the river side; or, in very dry weather, has to search after water, of which it generally finds sufficient in the hollows of leaves. Once only I saw two half-grown Orangs on the ground, in a dry hollow at the foot of the Simunjou Hill. They were playing together, standing erect, and grasping each other by the arms. It may be safely stated, however, that the Orang never walks erect, unless when using its hands to support itself by branches overhead, or when attacked. Representations of its walking with a stick are entirely imaginary. The Dyaks all declare that the Mias is never attacked by any animal in the forest, with two rare exceptions; and the accounts I received of these are so curious, that I give them nearly in the words of my informants, old Dyak chiefs, who had lived all their lives in the places where the animal is most abundant. The first of whom I inquired said:—'No animal is strong enough to hurt the Mias, and the only creature he ever fights with is the Crocodile. When there is no fruit in the jungle, he goes to seek food on the banks of the river, where there are plenty of young shoots that he likes, and fruits that grow close to the water. Then the Crocodile sometimes tries to seize him, but the Mias gets upon him, and beats him with his hands and feet, and tears him, and kills him.' He added that he had once seen such a fight, and that he believes that the Mias is always the victor. My next informant was the Orang Kaya, or chief of the Balow Dyaks, on the Simunjon River. He said: 'The Mias has no enemies; no animals dare attack it but the Crocodile and the Python. He always kills the Crocodile by main strength, standing upon it, pulling open its jaws, and ripping up its throat. If a Python attacks a Mias, he seizes it with his hands, and then bites it, and soon kills it. The Mias is very strong; there is no animal in the jungle so strong as he.'"

It is very remarkable that an animal so large, so peculiar, and of such a high type of form as the Orang-utan, should be confined to so limited a district—to two islands, and those almost the last inhabited by the higher Mammalia; but in the Mid-Tertiary Period, and just before the formation of the Himalayan Mountains, Orangs lived on the continent of India, and their remains have been found fossilised. With what interest must every naturalist look forward to the time when the caves and tertiary deposits of the tropics may be thoroughly examined, and the past history and earliest appearance of the great man-like Apes be at length made known!

The Orang-utans appear, from what has been written by all competent observers, to be of two kinds, the one larger, and the other smaller in stature; the first is called *Simia Satyrus*, and the other *Simia Morio*. Simia is translated in old Latin dictionaries as an Ape, or Jackanapes, and the term was used to designate the tribe or genus which should include all the species or kinds of man-shaped Apes. But after a while there was thought to be sufficient reasons for separating the Troglodytes from the genus Simia, and therefore this last-named one, instead of comprising the Gorilla, the Nschiego, the Koolo, the Soko, and the Chimpanzee, has but the Orang-utan.

Why this separation should have taken place is of course a very natural question, and the answer is that there are sufficient differences in the construction of the Orangs and the Chimpanzees and the others to warrant it. There is a greater structural difference between the Orang and the Chimpanzee than between this last and any of its congeners, that is to say, species included in the genus Troglodytes.

Moreover, on examining several skulls and skeletons of all these kinds, it seems as if, whilst the African Troglodytes may have descended from a common ancestor, probably a Baboon, the Orang-utan could not have come from the same stock.

There are some important distinctions in the anatomy of the Orang, some of which are evidently produced by adaptation to a particular habit or mode of life, and others in which the results of cause and effect cannot be traced.

In making its way through the forest, and in climbing so constantly, that any position on the ground is rare, the great length of the fore limbs is of immense use to them. They nearly touch the ground, so long are they, when the creature is erect, and this peculiarity separates them from the Chimpanzees. In climbing, the blade-bone is of great importance; and in the Orang it is broader, and more like that of man than in the Chimpanzee and Gorilla, and its spine is inclined upwards; and one of the processes of the blade-bone which has to do with the muscles which pass from the shoulder to the arm, and

which is called the coracoid, is more inclined downwards than in the Apes already described. Now, the blade-bone of the Chimpanzee and its coracoid are admirably adapted for climbing; why are they not, therefore, exactly like those of the Orang, and *vice versâ*? This is not a difference produced by adaptation of means to ends, but one which relates to the origin of the two animals, and to those which preceded them. The same is the case in respect of the wrist of the Orang. It has one bone more than the Chimpanzee, which has the same number as the other Troglodytes, and of man also. This bone is fixed in between the two rows of the bones of the wrist, and is called the "intermediate," and is found in the Monkeys which are below the Orang in the animal scale. It is an offshoot of the scaphoid bone.

Oddly enough, although the number of the ribs of the Troglodytes is thirteen, and probably in one of them there are fourteen, there are only twelve in the Orang; and the breast-bone, which consists of a large upper bone and several smaller ones (united above and below to each other, in the Troglodytes), has these bones separate and halved, as it were, sideways in the Orang, resembling in it the condition of the bones of the immature man. In the Troglodytes the round top of the thigh-bone, where it fits into its socket, the hip, has a kind of rope-like ligament attaching the one bone to the other, but this does not exist in the Orang. The knee-cap is very small, and the heel-bone hardly projects backwards in the Orang, and the "toe-thumb" sticks out at right angles from the foot, being about one-quarter of its length. The Orang is a great climber, and rarely, if ever, walks on its sole, which the Chimpanzee can do slightly. The general appearance and the nature of the movements of the foot of the Orang is that of a thin "club foot." All the turning-in of the bones of the foot in the Chimpanzee is exaggerated in the Orang, whose toe-thumbs are capable of great activity. Tame Orangs may be noticed to use the foot, which is longer than the lower leg, in climbing, as perfectly as the hand; and it appears that the frequency of their movements of grasping, rather than of delicate prehension, tends to the last joint of the "toe-thumb" becoming small and losing its nail.

A huge air-pouch is packed away in front of the windpipe, and amongst the muscles of the neck, as in the Apes already noticed, and it commences in the so-called ventricles of the larynx. Its extension amongst the upper muscles of the chest is most remarkable, for when full of air, these, being relaxed, it must blow out the upper part of the body and neck in a singular manner.

One of the muscles of the chest, common to man and Apes, the great pectoral (*pectoralis major*), has already been noticed as springing from the ribs, the breast-bone, and the collar-bone, and to be attached in front of the groove in the upper arm-bone, is not a continuous sheet of muscular fibre as in man, but is divided into a number of bundles, there being at least three great ones. Now, it is between these and in their intervals that the vast laryngeal air-pouch is found on the chest. Great as it is, however, it does not appear to have anything to do with the voice, except, perhaps, produce resonance during distension.

The muscles of the hips, thigh, and leg-bones of the Orang cannot be distinguished generally from those of the Chimpanzee; but it is evident that the position of some is such as to cause straightening of the knee very difficult, and on the contrary, they assist jumping and climbing, or any movement in which it can be kept permanently bent. As it is most convenient for the foot of the Orang to be well expanded during climbing or holding on, and not for its bones to be too much forced together sideways, the animal is deficient in a muscle which exists in man,* and which stretches transversely across, between the ends of the metatarsal bones. In like manner the inability of the thumb to perform many separate actions is produced by the absence of the flexor muscle; but there is a slip of a muscle whose tendon reaches the first joint, and its office is to oppose the thumb, not to the palm of the hand, but to the first joint of the second finger. This is a monkeyish peculiarity.

The animal, using as it does its short toe-thumb for grasping forcibly, requires all the power possible to be exercised between its bones and those of the ankle. Hence it has a muscle which exists in the hand but not in the foot of man, and which, from its drawing the bones together, is called the *opponens* (of the great toe). This does not appear to exist in the Troglodytes.

The other most important peculiarities of the muscles which relate to the greater but less independent movement of the toes and fingers, are the connection of the long flexor of the "toe-thumb" with the lower and outer part of the thigh-bone, and the possession of a complete set of deep extensor

* The *Transversus pedis*.

muscles for the four outer fingers. The extensor of the first, and the corresponding muscle of the little finger, subdividing to supply the third and fourth. This is the case in the next group of Apes also, but in the Troglodytes each of these muscles has but a single tendon.*

THE ORANG AND ITS NEST.

Before considering the anatomy of the brain, skull, and the inside of the Orang, it is as well to become aware of some of its peculiarities when young, and in a state of captivity.

* A muscle, called the *accessory flexor* of the toes, is absent in the Orangs, and one termed *scansorius*, or climber, exists on the outside of the hip and the joint of the thigh.

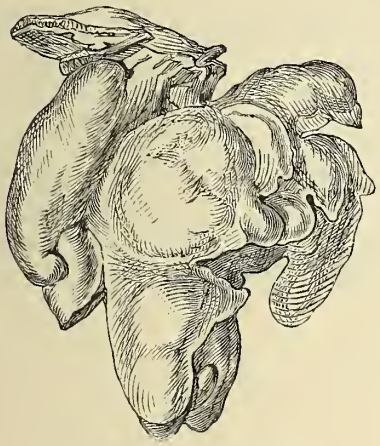
Several young Orang-utans have been brought to Europe and exhibited, to the delight of every one who saw them, but Mr. Wallace was fortunate enough to obtain one in its native haunts, and to observe it in its own climate. After shooting a female Mias, he found a little tiny one, lying face downwards, in the swamp where they were. "It was only about a foot long," writes Mr. Wallace, "and had evidently been hanging to its mother when she first fell. Luckily, it did not appear to have been wounded, and after we had cleaned the mud out of its mouth it began to cry out, and seemed quite strong and active. While carrying it home it got its hands in my beard, and grasped so tightly, that I had great difficulty in getting free, for the fingers are habitually bent inwards at the last joint, so as to form complete hooks. At this time it had not a single tooth, but a few days afterwards it cut its two lower front teeth. Unfortunately, I had no milk to give it, as neither Malays, Chinese, nor Dyaks ever use the article, and I in vain inquired for any female animal that could suckle my little infant. I was therefore obliged to give it rice-water from a bottle, with a quill in the cork, which after a few trials it learned to suck very well. This was very meagre diet, and the little creature did not thrive well on it, although I added sugar and cocoa-nut milk occasionally, to make it more nourishing. When I put my finger in its mouth it sucked with great vigour, drawing in its cheeks with all its might in the vain effort to extract some milk, and only after persevering a long time would it give up in disgust, and set up a scream very like that of a baby in similar circumstances. When handled or nursed, it was very quiet and contented, but when laid down by itself would invariably cry; and for the first few nights was very restless and noisy. I fitted up a little box for a cradle, with a soft mat for it to lie upon, which was changed and washed every day; and I soon found it necessary to wash the little Mias as well. After I had done so a few times, it came to like the operation, and as soon as it was dirty would begin crying, and not leave off till I took it out and carried it to the spout, when it immediately became quiet, although it would wince a little at the first rush of the cold water, and make ridiculously wry faces while the stream was running over its head. It enjoyed the wiping and rubbing dry amazingly, and when I brushed its hair seemed to be perfectly happy, lying quite still, with its arms and legs stretched out, while I thoroughly brushed the long hair of its back and arms. For the first few days it clung desperately with all four hands to whatever it could lay hold of, and I had to be careful to keep my beard out of its way, as its fingers clutched hold of hair more tenaciously than anything else, and it was impossible to free myself without assistance. When restless, it would struggle about, with its hands up in the air, trying to find something to take hold of, and, when it had got a bit of stick or rag in two or three of its hands, seemed quite happy. For want of something else, it would often seize its own feet, and after a time it would constantly cross its arms, and grasp with each hand the long hair that grew just below the opposite shoulder. The great tenacity of its grasp soon diminished, and I was obliged to invent some means to give it exercise and strengthen its limbs. For this purpose I made a short ladder of three or four rounds, on which I put it to hang for a quarter of an hour at a time. At first it seemed much pleased, but it could not get all four hands in a comfortable position, and, after changing about several times, would leave hold of one hand after the other, and drop on the floor. Sometimes when hanging only by two hands, it would loose one, and cross it to the opposite shoulder, grasping its own hair; and, as this seemed much more agreeable than the stick, it would then loose the other and tumble down, when it would cross both, and lie on its back quite contentedly, never seeming to be hurt by its numerous

A YOUNG ORANG.
(*From Wallace, by permission of the Publishers.*)

tumbles. Finding it so fond of hair, I endeavoured to make an artificial mother, by wrapping up a piece of buffalo-skin into a bundle, and suspending it about a foot from the floor. At first this seemed to suit it admirably, as it could sprawl its legs about and always find some hair, which it grasped with the greatest tenacity. I was now in hopes that I had made the little orphan quite happy; and so it seemed for some time, till it began to remember its lost parent, and try to suck. It would pull itself up close to the skin, and try about everywhere for a likely place; but, as it only succeeded in getting mouthfuls of hair and wool, it would be greatly disgusted, and scream violently, and after two or three attempts, let go altogether. One day it got some wool into its throat, and I thought it would have choked, but after much gasping it recovered, and I was obliged to take the imitation mother to pieces again, and give up this last attempt to exercise the little creature. After the first week I found I could feed it better with a spoon, and give it a little more varied and more solid food. Well-soaked biscuit, mixed with a little egg and sugar, and sometimes sweet potatoes, were readily eaten; and it was a never-failing amusement to observe the curious changes of countenance by which it would express its approval or dislike of what was given to it. The poor little thing would lick its lips, draw in its cheeks, and turn up its eyes with an expression of the most supreme satisfaction when it had a mouthful particularly to its taste. On the other hand, when its food was not sufficiently sweet or palatable, it would turn the mouthful about with its tongue for a moment, as if trying to extract what flavour there was, and then push it all out between its lips. If the same food was continued, it would set up a scream, and kick about violently, exactly like a baby in a passion. After I had had the little Mias about three weeks, I fortunately obtained a young Macaque Monkey (*Macacus cynomolgus*), which, though small, was very active, and could feed itself. I placed it in the same box with the Mias, and they immediately became excellent friends, neither exhibiting the least fear of the other. The little Monkey would sit upon the other's stomach, or even on its face, without the least regard to its feelings. While I was feeding the Mias, the Monkey would sit by, picking up all that was spilt, and occasionally putting out its hands to intercept the spoon, and as soon as I had finished would pick off what was left sticking to the Mias' lips, and then pull open its mouth to see if any still remained inside, afterwards lying down on the poor creature's stomach as on a comfortable cushion. The little helpless Mias would submit to all these insults with the most exemplary patience, only too glad to have something warm near it which it could clasp affectionately in its arms. It sometimes, however, had its revenge; for when the Monkey wanted to go away, the Mias would hold on as long as it could by the loose skin of its back or head, or by its tail, and it was only after many vigorous jumps that the Monkey could make its escape. It was curious to observe the different actions of these two animals, which could not have differed much in age. The Mias, like a very young baby, lying on its back, quite helpless, rolling lazily from side to side, stretching out all four hands into the air, wishing to grasp something, but hardly able to guide its fingers to any definite object, and when dissatisfied opening wide its almost toothless mouth, and expressing its wants by a most infantine scream; the little Monkey, on the other hand, in constant motion, running and jumping about wherever it pleased, examining everything around it, seizing hold of the smallest objects with the greatest precision, balancing itself on the edge of the box, or running up a post, and helping itself to anything eatable that came in its way. There could hardly be a greater contrast; and the baby Mias looked more baby-like by the comparison. When I had had it about a month, it began to exhibit some signs of learning to run alone. When laid upon the floor it would push itself along by its legs, or roll itself over, and thus make an unwieldy progression. When lying in the box it would lift itself up to the edge into almost an erect position, and once or twice succeeded in tumbling out. When left dirty, or hungry, or otherwise neglected, it would scream violently till attended to, varied by a kind of coughing or pumping noise, very similar to that which is made by the adult animal. If no one was in the house, or its cries were not attended to, it would be quiet after a little while, but the moment it heard a footstep would begin again harder than ever. After five weeks it cut its two upper front teeth, but in all this time it had not grown the least bit, remaining, both in size and weight, the same as when I first procured it. This was, no doubt, owing to the want of milk or other equally nourishing food. Rice-water, rice, and biscuits were but a poor substitute, and the expressed milk of the cocoa-nut, which I sometimes gave it, did not quite agree with its stomach. To this I imputed an attack of diarrhœa, from which the poor little creature suffered greatly, but a small dose of castor-oil operated well, and cured

it. A week or two afterwards it was again taken ill, and this time more seriously. The symptoms were exactly those of intermittent fever, accompanied by watery swellings on the feet and head. It lost all appetite for its food, and after lingering for a week, a most pitiable object, died, after being in my possession nearly three months. I much regretted the loss of my little pet, which I had at one time looked forward to bringing up to years of maturity, and taking home to England. For several months it had afforded me daily amusement by its curious ways and the inimitably ludicrous expression of its little countenance. Its weight was three pounds nine ounces, its height fourteen inches, and the spread of its arms twenty-three inches. I preserved its skin and skeleton, and in doing so found that, when it fell from the tree, it must have broken an arm and a leg, which had, however, united so rapidly, that I only noticed the hard swellings on the limbs where the irregular junction of the bones had taken place."

There is evidently much intelligence in the young Orang, when brought in contact with man, but probably in its native woods it leads very quiet and almost mechanical lives, there being nothing to develop extra instincts, thought, or unusual intelligence. Of course, some are more active than others, and many have to use greater exertion than others to obtain food. Hence, whilst there is no



THE AIR POUCHES OF ORANG.
(*After Temminck.*)

THE BRAIN OF ORANG.
(*From Royal College of Surgeons.*)

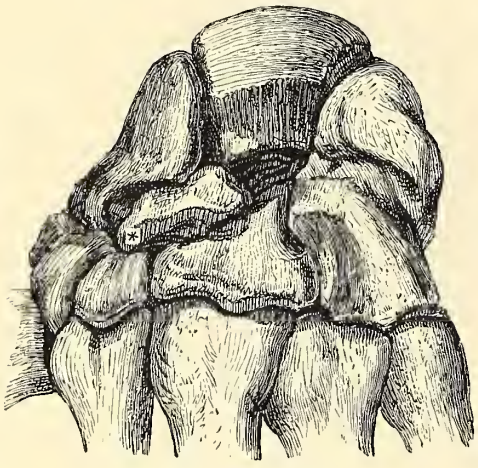
increased growth of the mental organ after Orang childhood, there may be great increase of the muscular structures. In the first instance, the brain case does not enlarge internally, and the old ones have no more brains than the young; and in the second, the ridges on the skull, the spines of the neck, and the markings on the bones generally do grow immensely, so as to give attachment to extra muscular fibres.

Moreover, besides these causes of growth there are those hidden ones which refer to sex, the old males acquiring a hideous aspect in our eyes, but lovely in those of the more comely female Miases, from the growth of long head ridges and the curious face pads. The bulk of the brain of an Orang is about one-half of that of a man of ordinary mind; and the brain itself, whilst it is higher in measurement than that of any of the Apes already mentioned, is long and flat in comparison with that of man. In front it tapers off slightly, and is not flat in front and below, for there the eye-cases or orbits, by projecting upwards, render the brain in their neighbourhood, as it were, excavated. As in the other Apes, the back of the brain is well developed, and the several parts distinguishable in man exist. One of the furrows so visible in the Troglodytes, which marks the side of the brain towards the back (the occipito temporal) is scarcely in existence in the Orang.

There is something very human in the appearance of the brain case in the young of both species of Orang. The back and sides have the peculiar "bumpy" look of those of the child; there are then no crests, and the brow ridges, extremely small, merge into a straightish forehead. The face looks long in front of the eyes, or orbits, and these are elliptical or oval, and approaching the circular in outline.

The cheeks look wide even in the young ones; and it will be noticed that the bone of the upper jaw (superior maxillary bone) has a short projection, which joins the molar or cheek-bone at some distance from the jaw. There is a hole or holes under the orbit in man and in the Troglodytes which transmits a nerve to the face, and people who have tic-douloureux know where it is very well; this is close to the junction of the molar and jaw-bones in the Troglodytes, but in the Orang this junction is much further off the middle of the face. This causes the extra width to the cheeks. The bone there forms the surface upon which the curious pad of fat and skin rests, which gives such an ugly look to the face in the old ones, when all these parts have grown to excess. The young have milk teeth, and in the upper jaw the last crushing or molar tooth has large cusps behind and projecting inwards, and the incisor teeth are equal in size. In the lower jaw the incisors are grooved in front in a curious manner; and the great molar teeth with five cusps have a curiously wrinkled-looking surface. Underneath the skull looks long, and the hole for the spinal cord is much longer than broad, and the joints or condyles are distant from the front of it. The palate is broad and the nose cavity also, and there is a bony styloid process connected with the ear-bone.

In the female of the Simia Morio, which is the smallest Orang, all the structures just mentioned as characterising the young Simia Satyrus and the young male Morio are exaggerated. There are faint frontal ridges also, and the back ridge or crest is shown, but there is hardly any difference in the size of the brain case. The front bone of the upper jaw is very distinct; and the creature, whose skull is in the British Museum, had its permanent teeth, the milk ones having fallen. There were the same number of teeth as in the Troglodytes and in man. But it is in the old males that the juvenile structures are greatly altered; and it is indeed hard to believe their skulls ever could have belonged to the same species. In the old males the brain case has not increased in its capacity, but it is furnished with huge ridges along the front and crossing behind. The ridges commence on the brow ridges and the outside of the orbits, which are no longer nearly circular, but flattened above; they pass on to the forehead, and curve to join in the middle line of the skull, forming a crest. This meets at the back a crest coming from the tip of each ear-bone. The cheek-bones are huge and wide apart; the upper canine teeth are great, and their sockets mark the face. The palate is huge, wide, and not arched; and the upper middle incisors project, and are very large, cutting indeed upon three of the lower ones.

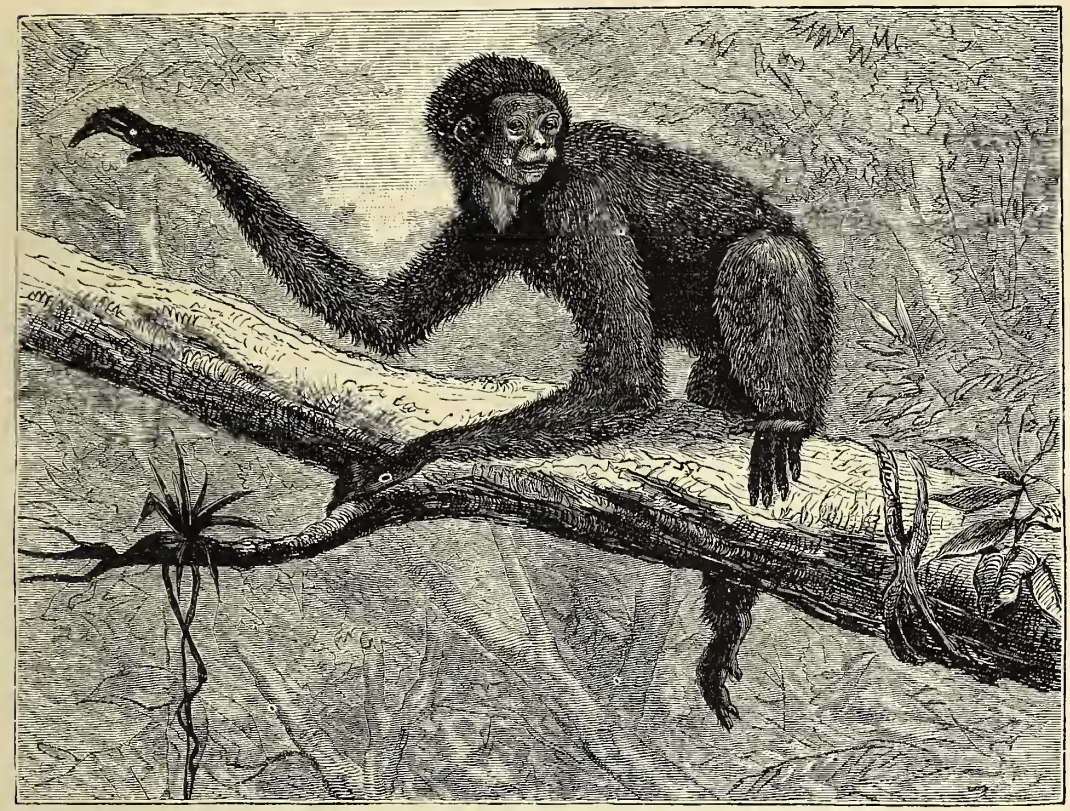


WRIST BONES OF ORANG.

All the roughnesses for the attachment of muscles are great, and the lower jaw is immense, and the tooth next to the lower canine—the first false molar—is pointed and cutting behind. Finally, the opening for the spinal cord (the foramen magnum) is round in front, and the condyle joints are close to its anterior margin. These are changes during the growth which are worth considering, especially as they cause the animal to depart from many of its man-like characters, which are so well seen in the young and in the females.

The Orang has no uvula, and the papillæ of the back of the tongue are in the shape of the letter V. Its stomach differs somewhat in shape from that of man and the Troglodytes, but its vegetable diet determines the existence of a large intestine which has a little ending or appendix (vermiformis) as in man.

* Is the intermediate bone.



THE SIAMANG.

CHAPTER IV.

THE MAN-SHAPED APES (*continued*)—THE GIBBONS*—1. THE SIAMANGS—2. THE TRUE GIBBONS.

General Characteristics of the Species—THE SIAMANG—Its Habits and Anatomy—Distinctness from the Orangs and Gibbons—Special Peculiarities—THE WHITE-HANDED GIBBON—Where Found—Its Cry—Its Habits—Special Anatomical Features—THE HOOLOOK—Where Found—A Young One in Captivity—Shape of the Skull—THE WOOYEN APE—Its Appearance and Habits—THE WOW-WOW—Very little Known about it—THE AGILE GIBBON—Reason of the Name—Peculiarities of the Anatomy—General Comparison of the Different Varieties of the Great Apes.

THE Orang-utan is not the only man-shaped Ape of the forests and jungles of the great Asiatic Islands, for there are several others to be found there, and which also live on the main land, from Malacca far away to the north in Assam; southwards, in the peninsula of Hindostan, and in South China.

They are less human-looking than the red Orangs, and they are smaller and more slender, but when they walk for a short distance erect, with the arms above the head balancing the body, their resemblance to a small and hairy "lord of creation" is considerable. A very slight glance distinguishes them from the Orangs; they have straight backs, small heads, large eyes, rather prominent chins, very long fore-arms, and their fingers reach the ankle in some, and the ground in others. Moreover, the Orangs sit upon a surface of hair, and these are furnished with a hard padlike seat which is bare, and is called a callosity, but they have no tail. They can run.

These long-armed Apes have a number of names, but as a whole they are called Gibbons; and as their outside and inside differences and distinctions from the Orangs are considerable and more than those of the kinds of Orangs between themselves, they are grouped into a separate genus. The

* Genus *Hylobates*.

Orangs form, as has been stated before, the genus *Simia*, and these Gibbons constitute the genus *Hylobates*, a term taken from the Greek ὑλοβάτης, a walker in the woods.

So far as their intelligence, amiability, and teachableness are concerned, they are equal to the Orangs, and indeed they seem to adapt themselves to the methods of men more readily. Not only do they become very fond of their keepers, but they recollect them after the lapse of time; and they are constantly let loose by those who keep them in India to wander about the trees in the neighbourhood, and they will return to be cared for, and come, when called, to be fed.

Interesting to those who study the intelligence of animals, they are equally so to the common observer, who delights in witnessing their surpassing agility, wonderful leaps, and graceful swings from bough to bough. But to the anatomist they present many complicated problems; for although evidently not so high in the animal scale as the Orangs and Chimpanzees, they have some things about them which cause them to resemble man more than do these great Apes, and others which cause them to resemble the great army of Monkeys. They are the last of the man-shaped in the classification, and the usual plan is to place them after the Orangs.

They are extremely delicate animals, although their fur is thick, and, in some kinds, long. They require a considerable temperature and very pure air; hence, although many have been brought to Europe, and exhibited to the delight of thousands, they do not live long, dying usually from consumption or from some lung disease. In the British Museum there are several groups of stuffed specimens of them, and also many skulls and skeletons, and a cursory examination of the first will prove that it is very difficult to distinguish one kind from another, for in the same kind, or species, there is a great variety of colour, and a different individuality in the two sexes and young. It has happened that the same kind has been called by several names by different observers, and it is only when the skeleton has been examined with the stuffed specimen that a satisfactory distinction between the species or kinds has been made.

Evidently, the whole of these long-armed Apes, with small heads and callosities on the seat, are separable into two divisions. In one the animals are larger than the others, and have a very singular adaptation of the foot for rapid movement amongst the boughs, and they have air-pouches; and in the second the animals are smaller, and have the toes free, and have no pouches. So the genus *Hylobates* is divided into two divisions: 1. The Siamangs. 2. The True Gibbons.

THE SIAMANG.*

Sir Stamford Raffles brought the Siamang prominently before the scientific world, and noticed the curious manner in which some of the toes were united, and he considered that this was to enable them to swing rapidly from branch to branch during their ordinary movements in the forest, when any stretching out of the fingers might be dangerous and produce a fall. But in this, as in many others, we owe to Mr. Wallace thanks for a concise description of the habits of the creature, which, from having its toes partly joined, has been named *Syndactylus*, from the Greek words σὺν and δάκτυλος, which mean "together" and "finger."

"A very curious Ape, the Siamang, was rather abundant, but it is much less bold than the common Monkeys, keeping to the virgin forest, and avoiding villages. This species is allied to the little long-armed Apes of the genus *Hylobates*, but is considerably larger, and differs from them by having the two first fingers of the feet united together, nearly to the end; whence its name. It moves much more slowly than the *Hylobates*, keeping lower down in the trees, and not indulging in such tremendous leaps; but still it is very active, and by means of its immense long arms—five feet six inches across in an adult about three feet high—can swing itself along among the trees at a great rate. I purchased a small one, which had been caught by the natives, and tied up so tightly as to hurt it. It was rather savage at first, and tried to bite, but when we had released it, and given it two poles under the verandah to hang upon, securing it by a short cord, running along the pole with a ring, so that it could move easily, it became more contented, and would swing itself about with greater rapidity. It ate almost any kind of fruit and rice, and I was in hopes to have brought it to England, but it died just before I started. It took a dislike to me at first, which I tried to get over by feeding it constantly myself.

* *Hylobates Syndactylus.*

One day, however, it bit me so sharply while giving it food that I lost patience, and gave it rather a severe beating, which I regretted afterwards, as from that time it disliked me more than ever. It would allow my Malay boys to play with it, and for hours together would swing by its arms from pole to pole, and on to the rafters of the verandah, with so much ease and rapidity, that it was a constant source of amusement to us. When I returned to Singapore it attracted great attention, as no one had seen a Siamang before, although it is not uncommon in some parts of the Malay peninsula."

There are some interesting points about the relation of the construction of this animal and its method of moving. Thus, in grasping a bough with the arm at full length above the head, so as to leave it with a swing in order to grasp another rapidly and for a correspondingly short period of time, the fingers require to be kept together as much as is possible, and to remain more or less bent on the palm. The long thumb may or may not be used, but in order to move efficiently it must be free, and also strong. Now in the Siamang these necessary peculiarities are present, and the common use of the finger and thumb in taking hold of things in the ordinary manner is sacrificed to them, and there is little or no delicacy of fingering or of prehension. Moreover, the fingers and thumbs are extremely thin and delicate, and in order to render the first finger less movable, it is, to a certain extent, deficient in its muscles of extension; and the common bending or flexor muscle of the fingers is very independent of that of the thumb. In compensation there is a special muscle found in this genus alone, which pulls the top of the second finger towards the thumb.* The skeleton of the hand shows that the fingers are slightly curved. There is no doubt that the hand of the Siamang, although it has these peculiar muscles, the curve of the bones, and also the extra bone noticed in the Orangs, is, as far as its skeleton is concerned, much more human than that of the other Apes. The extensor muscles of the fingers resemble those of the Orangs. The hand is larger than the foot in these animals, and the fore-arm is much longer than the upper arm.

A French naturalist states that the animal can leap, or, rather, swing—for it is done with the fore limbs—with graceful agility at least eighty feet, and the muscles of the arm, which are connected with the chest, aid in this. The pull is from the stationary arm—to the chest of the movable body by muscular contraction; and the greater the muscular connection between the arm and chest, the greater will be the movement. In order to provide for this, the great muscle of the front of the upper arm, the biceps (see page 26), is not only attached, as in the other Apes and in man, to the blade-bone just above the arm-joint, but also to the chest in front, for it is united there with the great muscle which springs from the ribs and breast-bone, and is attached high up to the arm (*pectoralis major*). In some of the other Apes this second part of the biceps is attached to a bent projection (coracoid) of the blade-bone, so that it has no direct attachment with the chest itself.

The Siamang can walk fairly in the erect posture by balancing with the arms, or by placing them over the head, and it has a great power of grasp with its toe-thumb. The shape of the foot resembles that of man more than that of the Troglodytes and Orangs, and the heel-bone is strong, and projects but slightly, and the toe-thumb is stout and long. The muscles of the foot are, as it were, more separate than in man, especially the flexors: and there is an extra muscle, an abductor of the third joint of the second toe.

The ability to walk well was proved when a tame Siamang used to walk along a cabin table at sea, without disturbing the crockery; and curiously enough this was better done than were some of the ordinary movements of the hand, for drinking out of the palm was a most ineffective and clumsy effort.

The bones of the foot resemble those of man more than do those of the Apes already noticed; but the first and second fingers are united by a fold of skin.

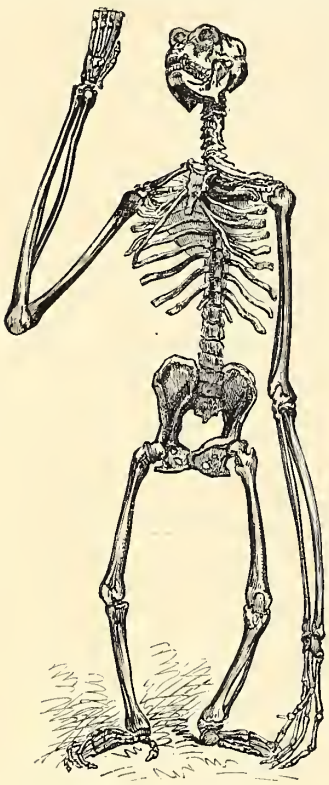
Under the jaw and along the throat of a tame Siamang, a large swelling, not very well covered with hair, was visible enough. This was a vast air or laryngeal pouch, and pressure emptied it into the throat. Hence the creature in this point resembles the Orangs and the Troglodytes, but the use of the sac could not be satisfactorily decided. The sac opens into the windpipe by two apertures, which are in a membrane that unites the base of the tongue and the organ of voice together. It has an uvula.

They are quiet, inoffensive animals, full of affection for man, and having good memories. Their

* The abductor of the third joint of the second finger. The thumb counts as the first finger.

temper is short enough sometimes, especially if there is any disappointment, but they have none of the mischievous tricks or malice of the Monkeys. Liking milk occasionally, they still mainly feed on fruit and leaves, and hence the nature of their teeth, the size of their jaws, and the capacity of their brain case may be fairly anticipated.

The bulk of the brain is less in comparison with that of the Orang, and the hind part does not quite cover or overlap the cerebellum, and the whole skull is long and low, and slightly broad behind. The most striking parts about it are the cavities for the eyes (the orbits), which are nearly circular in outline, deep, open, and swollen behind; moreover, they are wide apart, and there is no brow ridge connecting them. They, the face and the lower jaw, occupy only one-half of the skull, and the brain case is composed of the usual bones, which are extremely faintly ridged, the ridges extending on either side from the outer part of the orbit on to the frontal and parietal (or side head) bones. The back of the skull is rough, for the attachment of muscles, and the opening for the spinal cord and the joints for the top of the neck are far back, so that the head is set, as it were, forward in respect of the spine. There is a long and narrow roof to the mouth, and the diastema, or space in the line of the teeth, in front of the upper eye or canine teeth, is very distinct. These teeth are long, thin, and grooved, and project rather outwards as well as far below the other upper teeth. Yet, in all probability, this is not a bloodthirsty sign, but one which may have to do with sex, the males of many of the Monkeys possessing these great teeth only, or having them larger than the females. The first, or incisor teeth, occupy a very small space, and they and the two front molars are like those of man. An examination of the three true crushing molars shows the last, or that nearest the back of the jaw, to be the largest. They have four cusps or projections, which are small but decided, and somewhat resemble those of insect-eating animals.



SKELETON OF THE SIAMANG.
(*From the Cyclopædia of Anatomy and Physiology.*)

The lower jaw is very remarkable, for it has a good straight chin; and the joint and the part which passes from it to the body of the jaw, or the "angle," resembles that of man more than that of the rest of the Apes.

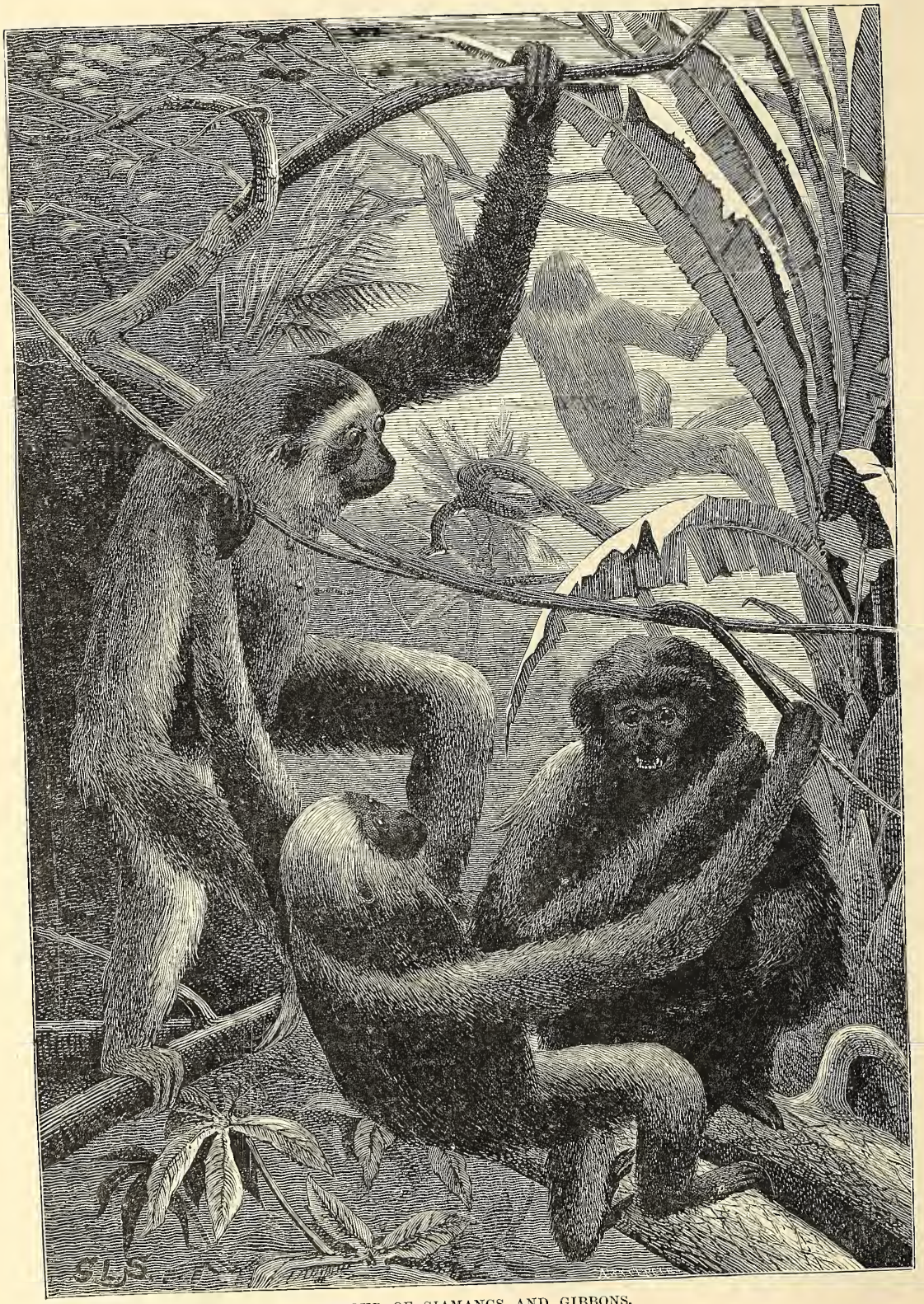
The lower teeth are very unlike the upper, and the canines are smaller; the first false molar is pyramidal, and has a cutting surface in front and behind. The true molars have at least five cusps or projections, and are admirably suited for the creature's diet.

One of the most curious points about the Siamang is that the broad breast-bone, the blade-bone, and large chest, and the ribs present human resemblances, but there are fourteen pairs of these last. The hip-bones are long and do not curve far in front, but the joint of the thigh is situated more after the manner of that of man than is the case in the other great Apes.

Everything in this creature's anatomy, and, amongst other things, its delicate, long bones, great grasp, supple back, small head, long neck, and long hair, assist in its peculiar life, which is evidently one of much climbing, swaying, swinging, and passing from tree to tree with the hands rather than with the feet. It lives in Sumatra and in the Malay peninsula.

THE TRUE GIBBONS.

The other kinds of Hylobates are called the True Gibbons, and although in their habits they greatly resemble the Siamang, they are smaller in size, and have some very remarkable structural differences. They inhabit the mainland of India and the great islands of Borneo and Sumatra, or, rather, all the great islands of the Indo-Malayan sub-region, except the Philippines. They are found in Sylhet and Assam, and Cambodja, in South China, to the west of Canton, and in the island of Hainan.



GROUP OF SIAMANGS AND GIBBONS.

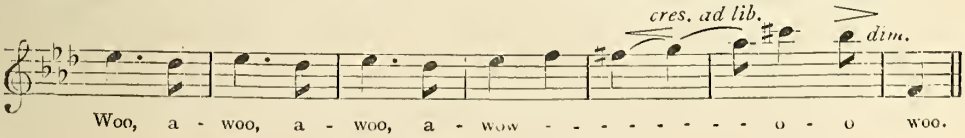
THE WHITE-HANDED OR LAR GIBBON.*

A well-known kind of Gibbon, which is found in Tenasserim, and is called the White-handed Gibbon, or *Hylobates Lar*. The old Latin dictionaries translated "lar" as a god who preserved both house and land, and presided over cities and houses, or the chimney or fireside; but this evidently does not apply to the Gibbon. But the Lar, or Lares, were demons, genii, or sprites, and probably the sprite-like activity of the Gibbons in their own woods suggested the name.

The Hylobates Lar is found in great abundance in all the forests skirting the hills, which run

THE WHITE-HANDED GIBBON. (*From a stuffed specimen.*)

from north to south in the country of Tenasserim, south-west of Birmah. They ascend the hills up to an elevation of from 3,000 to 3,500 feet, but not higher, and are met with in parties of from eight to twenty in number, composed of individuals of all ages. It is rare to see a solitary one; occasionally, however, an old male will stray apart from the flock, and perch on the summit of some vast tree, whence his howls are heard for miles around. The forests which these animals inhabit resound with their cries from sunrise to about nine in the morning, and their usual call may be thus rendered:—



The sounds vary from the deep notes of the old ones to the sharp treble of the young, in horrible unison. During these vocal efforts they appear to resort to the tops of the loftiest trees, and to call

* *Hylobates Lar.*

each other from different parts of the jungle. After nine or ten o'clock they begin to think of eating, and are soon engaged in feeding on fruit, young leaves, buds, shoots, and insects, for which they occasionally come to the ground. When approached, if alone, they will sit so close, doubled up in a thick tuft of foliage, or behind the fork of a tree, and so screened as to be safe from the shot of the sportsman. With a companion this manœuvre is of course useless. But even when the creature is forced from its hiding-place it is not easily shot, for it swings from branch to branch with its long arms, shaking the boughs all round, and flinging itself from prodigious heights into the dense under-scrub, and is quickly concealed from view. This long-armed Ape does not walk readily on its hind-legs, and has to stop frequently and prop or urge itself on, having the knuckles on the ground. In sitting it often rests on its elbows, and it likes to lie on its back. They make great use of their hind limbs, and of the hand-foot especially, for they will cling on and swing with their fore-hands, and steal and carry anything which pleases them with their hinder ones. In captivity it is generally a gentle, peaceable animal, very timid; but when captured after its young days have passed, it becomes very wild. The adults soon die, and even the young seldom reach maturity when deprived of liberty. They are born generally in the early part of the cold weather, a single one at a time, two being as rare as human twins. The young one clings safely to the mother for about seven months, although she swings and climbs to perfection, and then it shifts for itself. They may be made cross, like most creatures, by being teased, and anger is then shown by a steady look, with the mouth held open, and the lips occasionally drawn back to show the eye teeth, with which they bite severely. But usually it attacks with its long hands, which are at such times held dangling and shaken in a ridiculous manner, like a person who has suddenly burnt his fingers. It drinks in a curious and difficult manner, by scooping the water in its long narrow hand, and thus conveying a very little drop at a time to its mouth.

Usually the young are feeble, dull, and querulous in captivity, and sit huddled up together on the ground, seldom or never climbing trees. On the smooth surface of a matted floor they will run along on their feet and slide on their hands at the same time. By being fed solely on plantains, or on milk and rice, they are apt to lose all their fur, presenting in their nude state a most ridiculous appearance. Few recover; but a change of diet, and especially by allowing them to help themselves to insects, enables some to come round, and to resume their natural covering. For the most part they are devoid of those pranks and tricks which are exhibited by the smaller Monkeys. The length of a full-grown male was two feet six inches; the fore limb measured two feet one inch, and the hind limb one foot seven and a half inches. The Lar or White-handed Gibbon has a black skin and hair, and there is a white band round the entire face, across the forehead.

The Lar is common in its native haunts, and is subject to great variation in its colour. Some are dark brown or black, with white hands and feet, and they have the circle of white hairs around the face, the band across the forehead coming down in a peak above the nose. Others are ochre-brown, and have a lighter-coloured hand, foot, and anklet; whilst many are a dirty white. They take odd fancies, and likes and dislikes. Some which are allowed in India to roam about the grounds of the Zoological Gardens there will come in to sleep, and are gentle in the extreme to men, but extremely savage to women; others do not do this.

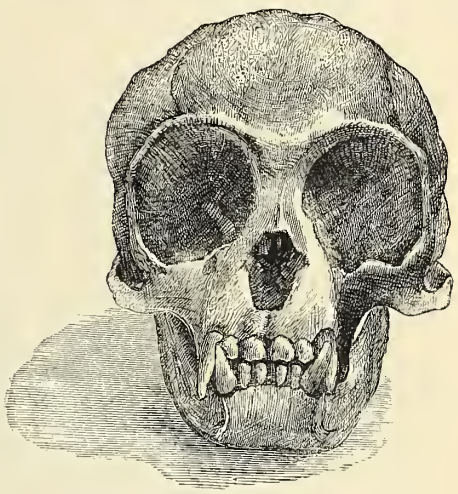
In looking at the collection in the British Museum, every one must be struck with the long necks of these creatures, which do not allow the little muzzle and snub-like nose to come down on a level with the breast-bone (as in the Chimpanzee, for instance), and also with the extremely narrow and long hands and feet, with their thin fingers. It will be also noticed that the nails of their thumbs and toe-thumbs are flat, whilst all the rest are claws. Their chin is less prominent than that of the Siamang, and this is shown in the skull. In the lower jaw there are some interesting differences between the Lar and the Siamang which cannot readily be accounted for; firstly, the crushing teeth wear in pits in the middle, whilst a ridge is formed in the Siamang; and in the Lar the angle of the jaw is decidedly turned in or inflected, as the term is, a condition which will be noticed in the other Hylobates.

No air or laryngeal sac is found in the Lar or in any Gibbon, and its noise has therefore nothing to do with such an organ.

Their swinging from branch to branch is assisted by the same arrangement of the muscle of the arm as in the Siamang; and they have the *transversus pedis*, which was stated to be wanting in the Orang, and it is united with the adductor of the thumb.

THE HOOLOOK.*

Naturalists have ransacked nearly every part of the globe for interesting animals, and have procured them from very out-of-the-way places. One of these localities was particularly difficult to get at years ago, for it is in the hills, far away to the north-east of Calcutta on the other side of the great river Brahmapootra, in Assam. Amongst the Garrow and Cossiah hills, where there are wild gorges, and uplands crowded with vast forests, overlooking the wide plains of the river-valley, there were many wonderfully active Gibbons. About two feet in length, they were capable of swinging with unerring certainty from branch to branch, many feet apart; and even the females performed these constant and natural movements while their young were hanging to them. They were black in colour, with white eyebrows, or, rather, a white band across the forehead. When caught, they soon became tamed, especially when young, and were docile and affectionate. One which was kept by Dr. Burrough was two feet six inches in length, yet the fore-limb was only five inches shorter than this, the length of the hand itself being six inches.



SKULL OF HOOLOOK.

So great was the disproportion of the legs and arms, that the first were, including the feet, only nineteen inches long, and the fingers touched the ground readily when he was standing erect. This Hoolook was of a deep black colour, and he had the usual simple band of white across the forehead, and black hands and feet. He was caught in the usual haunt of this species, not on the upper, but on the lower hills, which do not reach a greater altitude than 500 feet, and being well treated, he was easily tamed, and his habits were capable of being well watched. He liked the fruit of the peepul-tree better than anything, and bananas; but he took to rice and milk, and enjoyed snapping up a sweet or two, and especially delighted in Spiders. Meat he cared little about, and pork and beef he detested, but he liked fish occasionally. After about a month's captivity he took a great fancy to his master, and would come to his call, and sit up to breakfast. He liked to help himself to chicken and egg, and at first was very bad in his manners, dipping his fingers into the coffee and milk, and then sucking them. Afterwards he was taught to hold a cup and to drink from it.

He would walk erect slowly, first on one foot and then on the other, and would put his long arms over his head to balance his body, as it swayed first on one side and then on the other as his pace increased; then he began to run, and at last, grasping a bough, would swing himself forwards first with one hand and then with the other, getting over twenty to thirty paces with the greatest ease and regularity. He was timid, very reluctant to oppose those who teased him, and usually retreated at once. His master used to brush his skin for him when he was out of sorts, and the sensation appears to have been most pleasurable, and he evidently enjoyed the gentle friction very much. Falling ill he had a dose of calomel and a warm bath, the latter remedy being much more to his taste than the other.

The skull in the Hoolook has a less breadth across the orbits than in the Lar; and in that of a young one the sutures or joinings of the skull-bones are distinct, showing that the side-bones (parietal) of the head unite with the front (frontals), the temporal or ear-bones, and with a part of a wing-shaped bone which forms part of the base of the skull (sphenoid bone). The angle of the jaw projects backwards, and it is slightly turned in; moreover, the projections or cusps of the lower back teeth are five in number, and are prominent-looking and very sharp, as if they could crush a beetle as well as crack a nut.

THE WOOYEN APE, OR YUEN.†

A number of Apes were found in company on a small island near Camboja, and at first sight they appeared to be of different kinds, although they all had the long arms and the general appearance of

* *Hylobates Hoolook.*

† *Hylobates pileatus* (GRAY).

the "Long-armed Apes" (*Hylobates*). But a careful examination proved that they belonged to one particular species, the individuals of which differ greatly in their colour during different parts of their lives. The young were uniformly dirty white in colour, and had no black spots on their chests or heads. The females were white, with the fur of the back brownish-white, slightly waved, and there was a large black spot on the crown and one on the chest. On the other hand the male was black, and the back of the head, body, and legs grayish. The hands were white. This variation in colour at different ages and in different sexes in one kind should teach us that something more than mere outside distinctions are requisite for deciding the value of what are called species. The dark cap-like mass of hair on the head gives the name to this Ape. Evidently the animal is a puzzle and a source of the

THE HOOLOOK. (*From a stuffed specimen in the British Museum.*)

marvellous to the Chinese, for one of their gazetteers gives a mixture of correct information regarding its natural history, and of what has been drawn from a very vigorous imagination.

It is described in the following manner, as coming from the district of Hainan:—"Yuen—male black, female white, like a Macaque, but larger, with the two fore-arms exceedingly long. Climbs to tree-tops, and runs among them backwards and forwards with great agility. If it falls to the ground it remains there like a log! Its delight is in scaling trees, as it cannot walk on the ground. Those desiring to rear it in confinement should keep it amongst trees, for the exhalations of the earth affect it with diarrhœa, causing death; a sure remedy for this, however, may be found in a draught made of the syrup of the fried foo-tse" (seeds of *Abrus precatorius*, the Indian liquorice).

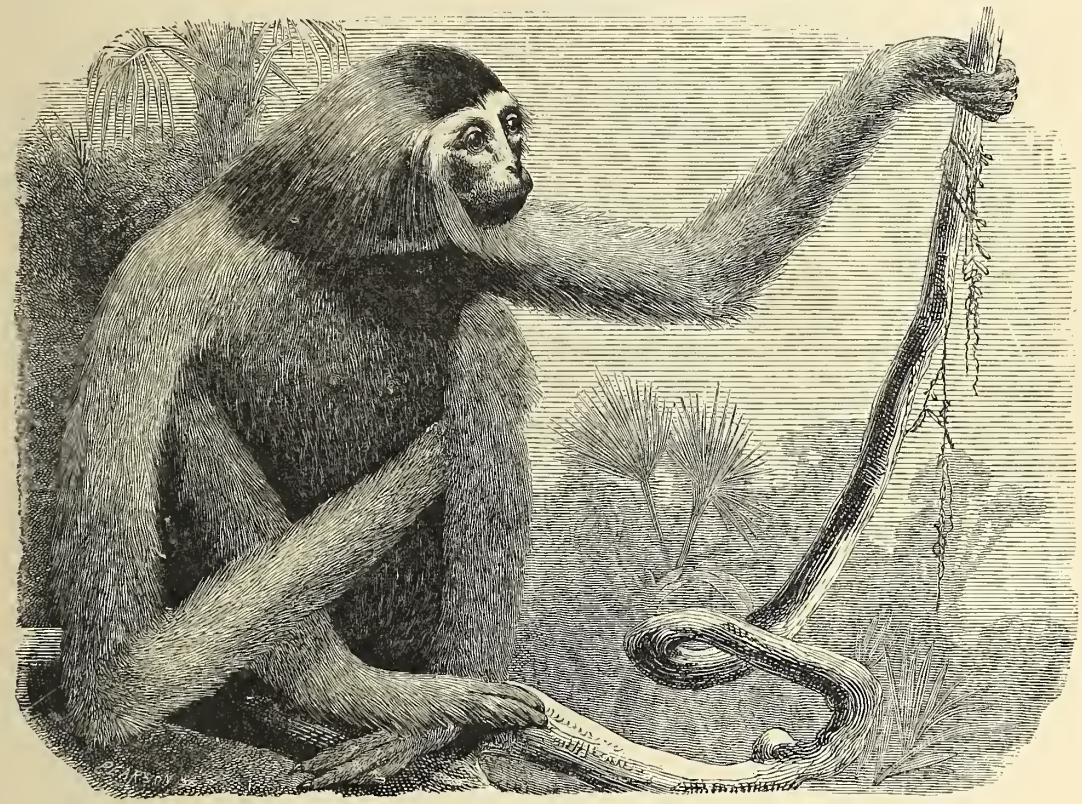
In a work called *Pun Yu liang che*, the various kinds of Yuens are mentioned which are known to the author. "There are three kinds of Yuens—the Golden-silk Yuen, which is yellow; the Jade-faced Yuen, which is black; and the Jet-black Yuen, which has the face also black. The Golden-silk and the Jade-face are both difficult to procure." "Hainan has also the Rock Yuen; it is small, about the size of one's fist. If allowed to drink water it grows in size. This is also called the Black Yuen, and

is difficult to obtain." "The word Yuen is given to them from their love of climbing and their wild disposition."

In Central Hainan the magistrate of the district was of opinion that the Yuen had the power of drawing its long arm-bones into its body, and that when it drew in one it pushed out the other to such an extraordinary length that he believed the two bones united in the body. He used the front bones of the arms for chopsticks.

THE WOW-WOW.

A species which is called the Wow-wow, or Silvery Gibbon (*Hylobates leuciscus*), is perhaps more interesting to the anatomist than to the observer of the habits of animals; for nothing is known about



THE WOOYEN APE. (*From a stufied specimen in the British Museum.*)

their method of living. Their skull shows a decided ridge or crest along the top, which branches well in front into two ridges going to the front over the orbit. Moreover, the chin of the lower jaw is very deep, the angles slightly turned in, and the eye teeth are thin and sharp.

THE AGILE GIBBON.*

This animal is also interesting, from having a great twist inwards of the jaw behind, and two curious ridge-like crests on the head. Its name conveys the extreme agility of the animal, as observed in confinement.

These Gibbons have many interesting points about them, and one of the most curious is that they have no air or laryngeal pouches, and yet their general anatomy, especially of the muscles of the throat, neck, and body, is the same as that of the Siamang, which has been noticed above to have a vast pouch. The brain is small, especially behind, but why it is difficult to imagine, for the Spider Monkey, which lives in the New World, and whose feats of agility resemble those of the Gibbons,

* *Hylobates agilis.*

has a very large back portion of the brain, large even in proportion to that of man; and the importance of this difference is all the greater when it is remembered that all the last investigations into the actions of the nerves arising from the sides of the brain towards the back connect them with motions of the hands and fore-limbs especially. But it is possible that the back of the brain in the Siamang appears to be smaller than it really is, because of the large size of the cerebellum. The skulls of the Gibbons are very man-like, and more so than those of the other Apes, and this is because of their faces and jaws being smaller in comparison with the brain case. If the young of all the great Apes

THE AGILE GIBBON.

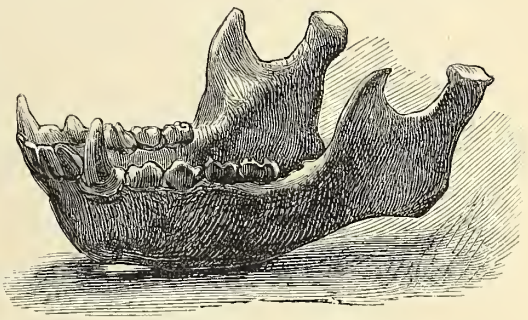
be examined, their skulls will appear much more human than those of the adults, because the brain and face grow up to a certain point together and equally; but with age the brain does not increase in size proportionally with the face, which grows on, and finally preponderates in size. But if the skulls of the young Apes be compared one with the other, that of the Siamang will really not look as human as that of the Gorilla or Chimpanzee.

The Gibbons have a very small appendage to the blindgut, and they have hard bare pads or callosities on the seat, and these structures connect them with the next group of Monkeys, which cease to be man-shaped; and indeed the Gibbons and Siamangs, although man-shaped (Anthropomorpha), occupy neutral ground between the Orangs and the Cynomorpha.

Formerly, in those ages when the Orang lived on the continent of India, the Gibbons roamed far over the vast land surfaces of the period, and lived in Southern France. Portions of the skeleton of

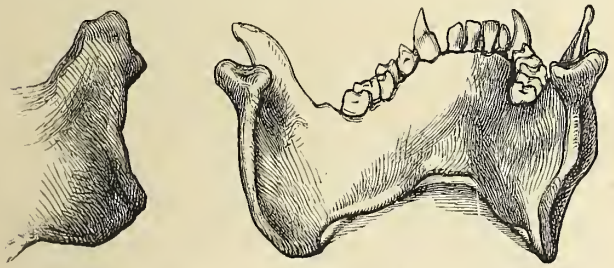
an Ape as large as a man, but which resembled the Hylobates, were found there, and named *Dryopithecus*, in strata of Mid-Tertiary age.

In concluding this part of the subject, which relates especially to the man-shaped Apes, some very obvious reflections occur. There is something very interesting as well as instructive and suggestive in the study of the proportions of the limbs to each other and to the body in the larger Apes, of which the Gorilla is the highest in the scale, and in man. The fingers in man hang down to below the middle of the thigh; in the Gorilla they attain the knee; in the Chimpanzee they reach below the knee; in the Orang they touch the ankle; in the Siamang they reach the sole; and in some Gibbons the whole palm may be applied to the ground without the trunk being bent forward beyond its natural position on the legs. It is also found that in man the arm-bone exceeds in length each of the bones of the fore-arm in a marked manner, and in the Gorilla and Chimpanzee it does so but slightly; the bones are equal in the Orangs, and very unequal in the Gibbons, those of the fore-arm being the longest. When the length of the arms down to the wrist is compared with that of the body, omitting the legs, there is not much difference between man and the Gorilla, but it increases in the Chimpanzee, Orang, and in the Siamang. The lower limbs are short in the Gorilla, and this is characteristic—they offer but a poor support to the huge body—and the resemblance to the symmetrical proportion of the legs to the body in man is scanty indeed. This disproportion is greater in the Chimpanzee and Orangs, in which the lower limbs are pigmies.



JAW OF THE GIBBON.

Consider the hand in the same manner. Man's perfect hand, writes Owen, is one of his peculiar physical characters, and that perfection is mainly due to the differences of the first and the other four fingers, and the ability of this first to be opposed to them, as a perfect thumb. A partially opposable thumb, that is to say, one which can be brought over the palm, more or less, is present in the hand of the great Apes. It is large in the Gorilla, so far as Apes are concerned, and it reaches, when it and the fingers are stretched out, to just a little beyond the first joint of the first finger, or rather of its first movable part. But in the Chimpanzee and Orang it does not reach to the joint, and it is longest and strongest in proportion in the Gibbons (*Hylobates*). In the Gorilla and the Chimpanzee, the wrist-bones are eight in number, but there are nine in the Orangs and Gibbons.



BACK OF JAW OF THE AGILE GIBBON.

The toe-thumb is about five-twelfths of the length of the whole foot in the Gorilla, and it is slightly longer in the Chimpanzee and Hylobates, but it is not more than a fourth of the length of the foot in Orangs.

The nails of all the fingers and toes of the great Apes are flattened, except in the Hylobates, whose thumb and toe-thumb nails only are so; the rest are more claw-like.

Finally, as regards the brain and nervous system. In the man-shaped Apes the brain is smaller as compared with the nerves which proceed from it than in man; and the brain proper is smaller relatively to the cerebellum than in man. The convolutions, the fissures, and eminences of the brain are generally less complex, and those of the two sides or hemispheres of the brain are more symmetrical than in man. The sides of the brain or the hemispheres are rounder and deeper in man, and the proportions of their lobes to one another are different. Some convolutions and fissures present in man are less perfectly formed, but still exist in the Apes, and the cerebellum is not covered entirely in the Hylobates, but it is in the other Anthropomorpha.

CHAPTER V.

THE DOG-SHAPED MONKEYS*—SEMNOPITHECUS—COLOBUS.

General Characteristics of the Monkeys of the Old World—Distinguished from the Apes by Length of the Hinder Limbs, and presence of Tails—Divided into those with and those without Cheek-pouches—Use of the Cheek-pouches—The two Genera of Pouchless Monkeys—THE SACRED MONKEYS, or Semnopitheci—Derivation of the Name—First Discovery—Ape Worship in India—General Description—Limited to Asia—THE SIMPAI—Its Locality and Appearance—THE BUDENG—Hunted for their Fur—Its Colour and Appearance—THE LONG-NOSED MONKEY—Reason of the Name—Quaint Appearance of the Young—Anatomical Peculiarities—Their First Appearance in Europe—Description of the Nose—Peculiar Formation of the Stomach—Bezoars—THE HOONUMAN MONKEY—The Sacred Monkey of the Hindoos—Legends about it—THE DOUC MONKEY—Its Appearance and Habitat—THE BLACK-LEGGED DOUC—Anatomical Peculiarities—THE CROWNED MONKEY—THE RED MONKEY—THE SUMATRA MONKEY—THE WHITE-BEARDED MONKEY—Found in Ceylon—Its Intelligence—THE GREAT WANDEROO—Other Ceylonese Monkeys—THE GENUS COLOBUS, or Thumbless Monkeys—Description of the Hand and Wrist—Different Varieties—COLOBUS VERUS—COLOBUS GUEREZA—Their Habitat and Peculiarities—Fossil Semnopitheci.

THE Apes which have formed the subject of the previous chapters, and which, from their greater or less resemblance to man, have been called the *Anthropomorpha*, have long arms, short legs, and no tails. The great length of the fore limb distinguishes them not only from man, but also from all the other Quadrumana, and so does the relative shortness of the hinder limbs. The length of limb is thus sufficient to afford data for classifying the Quadrumana of the Old World in two great groups, of which the Anthropomorpha form the first, and the rest of the Monkeys the second. In these the fore limb is invariably the *shortest*, and the hinder one the *longest;* so that there is exactly the reverse condition of that observed in the great Apes. With regard to the tail question, it may be stated that, whilst many species have very long tails, others have them of moderate length, and a few have none.

The Monkeys of this second group, or the Cynomorpha, all of which live in the Old World, have a thin division (septum) between the nostrils, whose openings look downwards, or downwards and outwards. They are Catarrhine Quadrumana (see page 3), and many have cheek-pouches, but not all, whilst all have the peculiar pads, more or less brightly coloured, which are placed where the animal sits, or on the swelling of the haunch-bone. All these Old World Monkeys have the same number of teeth as the Apes already described, and arranged in the same manner, and most have a laryngeal, or air pouch; but there is great diversity in their size, shape, and in the method of progression of the body and shape of the head, and also in the construction of the brain and internal organs. Moreover, the arrangement of the muscles and of the backbone differ.

The presence or absence of the cheek-pouches, the peculiarity in the shape of the teeth, the shape of the body and limbs, and the method of moving along, are all matters of importance to the zoologist, for by them he is enabled to arrange these Monkeys in genera and species, so as to give the naturalist the proper name of the kind whose habits he may be studying. Moreover, the comparative anatomist, in examining the insides of these creatures, and explaining their peculiarities of internal construction, is able to account for many habits and the presence of many structures, as well as to assist the zoologist. For, a classification, to be good for anything, must be more than skin deep, and must depend upon the differences in those parts which are not readily changed by habits or peculiar methods of life.

The Monkeys of the Old World, excluding the great Apes already described, and including alone those with long hind limbs, may be divided into those without cheek-pouches and those which have them; and those in the first division form the subject of this chapter. Cheek-pouches may be seen crammed with nuts in most of the Monkeys at the Zoological Gardens, and the appearance given to the face is as if the skin on either side of the lower part of it were distended. When there are no nuts thus stowed away, the cheeks do not present a swollen or unusual appearance. The Monkey does not force nuts outside its jaws and between them and the cheeks so as to simply distend

* *Cynomorpha.*

them, but it presses its food into what look like some folds in the cheek. These unfold, and form a bag or pouch on either side of the face, and the animal can eat, scream, and scold with the pouches full, and without their contents coming by chance into the mouth. The gift of a cheek-pouch is of great importance to a Monkey; it is a stowaway for his food, which may have to be carried some distance before it can be eaten. And it must be remembered, that not only have the Monkeys very indefinite notions of *meum et tuum*, but that they are surrounded by dangers from many other

FACE OF THE BLACK-CRESTED-MONKEY.

animals; they are communists, and their motto is *la propriété c'est le vol;* and, on the other hand, the great beasts of the earth, whose stealing is less thought of, because it is done with great violence, openly, and on a large scale, put down the Monkeys whenever they have the chance. But Nature, ever a considerate mother, whilst she is exceedingly economical, and does not allow any structures to be unused or wasted without gradually abolishing them, often gives animals which are defective in some things very important compensation.

The pouchless Monkeys are evidently at a disadvantage; but by this system of compensation they have very peculiar stomachs, in which they can stow away quite as much food before more is absolutely wanted as their pouched friends can. The nature of this stomach will be noticed further on; and it is

only necessary to observe that it is not in existence in the cheek-pouched division at all. The cheeks of the Monkeys with the peculiar stomach, on the other hand, are not pouched, but there is just the vestige of a fold or two, which, although of no use, still remains as an evidence of their ancestry —for, doubtless, these are descended from those with pouches. The great Anthropomorphous Apes have no cheek-pouches, neither have the American Monkeys; and, for reasons which will be noticed in treating of these last, they have not the complicated stomach of the Old World pouchless.

The pouchless division of Monkeys with complicated stomachs, and which, of course, have long hind limbs, comprehends two genera—the genus Semnopithecus, and the genus Colobus.

THE SACRED MONKEYS.

The Semnopitheci, or the Sacred Apes—from σεμνός (sacred), and πίθηκος (an Ape)—were probably known to the Greeks who invaded India under Alexander the Great; and Ctesias, a Greek writer, who was taken prisoner by Artaxerxes of Persia, at the battle of Cunaxa, some 400 years B.C., studied them. He was kept for seventeen years at the court of that monarch, and made notes on most subjects, and also on the natural history of Persia and India. On his return to Athens he gave the world the results of his observation in a book, and in it he treats of two Apes, one of which was smaller than the other, and had a very long tail. This was a Semnopithecus, for the genus is especially Asiatic; but the ancients did not discriminate between the long-tailed Apes of Africa and those of Asia, but called both Cercopithecus—from κερκος (a tail), and πίθηκος (Ape). At the present time the word Cercopithecus is restricted to the kinds which live in Africa. These differ in their internal construction from the Asiatic varieties.

During the rise of the religion of Brahma, the contemplation of the Creator became singularly mixed up with the worship of the created, and many animals became sacred. Hence, when one of those wandering restless spirits, Gasparo Balbi by name, started in 1570 from the town of Venice, where he was a jeweller, to reach the Indies, and came to the end of his journey, he saw many a long-tailed Ape worshipped and petted by his customers. He wandered amidst many a danger—but the people were honest then—and reached Aleppo. Then he went by caravan to Bagdad, and got to Old Babylon—by the way, "a place perilous for robbers and lions." Reaching Bagdad, he embarked for Balsara, and reached that place after escaping whirlpools and hot and deadly winds. Thence he went to the cities of St. Thomas, by the Seven Pagodas, in Southern India. Leaving there, and much troubled by tigers, he crossed the Ganges and got into Pegu on the Irrawaddy. He admired the Pagodas, or as they are there called, "the Varelles of the gods," and says that about them are found "tyed many Apes of that kind which resemble Mountain Cats, which were called Monkeys; they keep them very carefully, holding them to be creatures beloved of God, because they have their hands and feet like human creatures, and therefore the woods are full of them, for they never take any except for their Varelles and statues." This regard for the Long-tailed Monkey has lasted, and probably is only now diminishing under the influence of the rationalistic philosophy of the wicked Europeans, who will not see anything holy in an Ape. Certain it is that the follies of Ape-worship were carried on to a wonderful extent, and that these creatures have been preserved to the serious detriment of crops, comfort, and temper.

The regard of the natives for them was, and probably is still, sincere, and their boldness—the result of immunity from persecution—was discovered very early in the English occupation of India; for Tavernier tells a story of an English "President," who asked him to shoot some Monkeys, which were amusingly audacious by the river side. He complied, and a female fell dead with her young clinging to her. This so enraged the Monkeys that sixty of them descended at once, and had it not been for the serving-men, and the carriage being shut up, they would have strangled the "President." They followed the carriage for many miles. Then we are told about Indian princes spending fortunes in the marriage-feasts of Apes; and of cultivators of the soil being scared away and subjected to all sorts of rapine by these holy creatures. All this goes to prove that generations of Hindoos have believed in the sacred character of the Monkey, and have placed him in their mythology.

So Fred. Cuvier, when he wanted a name, termed them Sacred Apes, or *Semnopitheci*. They have been called Slow Apes, but this is quite a misnomer, for when awake, and not tired, they are as full of fun, activity, and play, but not as full of malice, as the others.

Wallace, in his charming book of travels in the great Islands of Sumatra and Borneo, thus notices how full of life they are:—"In Sumatra, Monkeys are very abundant, and at Lubo Raman they used to frequent the trees which overhang the guard-house, and gave me a fine opportunity of observing their gambols. Two species of Semnopithecus were most plentiful—Monkeys of a slender form, with very long tails. Not being much shot at, they are rather bold, and remain quite unconcerned when natives alone are present; but when I came out to look at them, they would stare for a minute or two, and then make off. They take tremendous leaps from the branches of one tree to those of another a little lower. It is very amusing when one strong leader takes a bold jump, to see the others following with more or less trepidation; and it often happens that one or two of the last seem quite unable to make up their minds to leap till the rest are disappearing, when, as if in desperation at being left behind, they would leap as far as they could, and often come crashing down into the underwood."

The Semnopitheci may be described as Monkeys with hind limbs long, and larger than the fore limbs, with slender bodies, usually highest at the tail, and round heads, and with not very prominent faces, and very long tails. They have callous pads on the haunch-bones, and in some there are slight folds inside the cheeks, but no pouches. The hands have thumbs, and the last tooth of the lower jaw (the third molar) has a prominent heel to it, or cusp, besides four others. They are of all sizes, and the largest are bigger than a Pointer Dog; but they are all slightly made, and their long bodies, thin as a rule, are larger in the stomach than in the chest. Their tails, which hang down and are not curled up, distinguish them pretty readily.

The Monkey which shows the peculiarities of the genus *Semnopithecus* more than others is, perhaps,

THE BLACK-CRESTED MONKEY, OR THE SIMPAI.*

It was noticed and described by Sir Stamford Raffles as a native of Sumatra, where it is frequently seen in the neighbourhood of Bencoolen. It has a long and slender body, very long hind-legs, and the tail end is higher than the shoulders in walking. The fore-legs are short, and the tail is very long, and exceeds thirty inches in length, and the head is small and wonderfully straight in the forehead and face.

The colours of this Simpai are very different to those of the great Apes already mentioned. Here variety of colour replaces the sameness of the tints of the large Anthropomorpha. First, there is a long crest of black hair on the top of the head, which passes slightly round the face close. On the cheeks there is a tuft of fawn-coloured hairs, which graduate into white. The forehead is of a light fawn-colour, and the face is naked, slightly wrinkled, and of a blue tint. The under parts of the body are very white, and on the back and neck the colour is bright yellow and red. The palms and soles are black, the thumbs are small, and the callosities are large.

THE NEGRO MONKEY.†

This is, as the name implies, a black Monkey. It is intensely black, except underneath, and at the root of the tail, where there is a grey tint. The paws are long, delicate, and silky, and become slightly grey on the head and back with old age. Like most black things, it leads a troubled life, being chased and hunted, not, however, in this instance so much for amusement as for the pretty black fur. They live in great troops, in the Javanese forests, and sometimes fifty or more individuals associate together. They make rude nests on trees, and are extremely timid, making off with great haste if they are disturbed. A long series of generations have been chased and killed by the natives of Java, and therefore the present Negro Monkeys are exceedingly shy, and bolt from the face of man at once. And yet, although thus timid and anxious to get out of the way, they have the reputation of being dangerous, and really unwittingly they may be so. On the approach of men they utter loud screams, and scamper off amongst the trees, helter-skelter. Now in doing this, they break dead branches off, and sometimes a large fruit or nut comes tumbling down some score or two of feet. These are supposed to be thrown by the Monkeys, but such is not the case. Having this bad character, the "Negroes" are cudgelled with sticks, and killed in numbers very cruelly.

* *Semnopithecus Melalophus.* † *Semnopithecus Maurus.*

Their pretty fur is much prized, and the chiefs of the country arrange the hunting parties, treating the Monkeys really as beasts of the field. The skins are prepared by a simple process which the natives have learned from Europeans; and they conduct it with great skill. It affords a fur of a jet-black colour, covered with long silky hairs, which is used by the natives and Europeans there in ornamenting riding saddlery and in military decorations.

When young, they are of a brown or reddish tint, and thin grey tints appear preceding the intense black; they then eat buds and shoots and tender leaves, but in adult age they are fruit consumers. When in captivity they are sullen and morose, and they will remain sulky for many months. This the natives know, and therefore they never try to tame them, or to have them in their houses. In their shape they resemble the last Monkey described, and their hind limbs are very long, their haunches being high.

THE NEGRO MONKEY.

They are rather more than two feet long in the body, and the neck appears short; both shoulders and chest are short and largely made. The tail is as long as the body and head, and is often slightly tufted at the end. A mop of hair surrounds the face, and the hairs are long and closely pressed, and quite conceal the forehead. The nose is peculiar, for the bones of it are ridged, as it were, and the skin is drawn tight over the open nostril (nares), so that there is no soft nose. A very considerable space exists between the nostrils and the mouth, and the lips are small and thin.

THE LONG-NOSED MONKEY.*

Of all the remarkable oddities of Nature amongst the many-shaped Monkeys, the Long-nosed or Proboscis-carrier stands pre-eminent. In fact, there is nothing in human or ape nature like the face of one particular Long-tailed Semnopithecus from Borneo. Monkeys have flat noses as a rule, some have a ridge and a little fleshy mass in which the nostrils end; others, like the Baboon, have dog-like noses, and the Americans have wide noses, the nostrils opening well at the sides. In man there is the Roman nose, the pug, the straight, the flat, the broken, the long with a large end, and the short with a turn up, but the Nasalis Monkey stands alone amongst the Primates with a nose of vast proportions, which projects far in advance of the mouth, and whose nostrils open underneath. It grows with age, and commences as a small "turn up," which still is more fleshy and longer than the nose of any Monkey. The newly-born Nose Monkey is a most extraordinary object, reminding the critical eye of many youths of weak constitution and defective brains. Its hair is wonderfully parted down the middle, and brushed by Dame Nature down the sides of the head and a little backwards; the whiskers take the latter direction, and the ears stand out just behind them. It has drooping eyelids, a longish

* *Semnopithecus Nasalis.*

upper lip, with just a little sign of coming hair, and then there is the funny nose, the upper part like a boy's, but the end seems to have been pulled out and turned up, so that the nostrils are quite at the tip. The face has a tinge of blue about it, and the animal, even when old enough to be sitting on a tree, looks sad and melancholy.

They grow to the size of a large Pointer Dog, and are powerful animals, assembling in troops, and playing and associating probably with the Orangs. Stuffed specimens of the Proboscis Monkey are usually simple caricatures, and by no means good ones, for they do not give one-half of the curious appearance of the face. In nature, and in drawings taken shortly after death, the first thing that strikes one is the flat top to the head, and the red hair there, starting from the top of the crown, and radiating in all directions, and coming as a very sharp line straight over the eyebrows, and cutting the forehead very short. Then the prodigious nose, stuck out some inches in front of the mouth, is,

THE LONG-NOSED MONKEY.

with the rest of the face, naked, and of a reddish-brown flesh-colour. The eyes are wide apart and open, and are of a hazel colour. The whiskers clasp the face, as it were, and are brushed back, and join the hair of the neck, whilst the little beard sticks out like a goat's. The mouth is wide, and the chin recedes. It is a long-bodied creature, and there is a great bend outwards in the back when it squats on its haunches. There is a good-sized chest, there are long arms, still longer legs, and a great tail. The prevailing colour of the back and shoulders is the red or dark-red brown of the head hair, whilst the rest of the body is of a lighter tint, the tail and limbs especially. The thumb of the hand is small, and barely reaches as far as the first finger-joint, but the toe-thumb is large, widely set from the foot, and the skin-fold comes far down it, as also does a web between the toes, the third of which is the longest.

The skull of this Monkey greatly resembles those of the other Semnopitheci. The face part is smaller in comparison with that of the great Apes, but then it is not much larger than the brain case. There is a faint ridge at the side, and the usual one from one ear to the other exists. The front of the face on either side of the opening for the nose is rather larger and more prominent than in

some other kinds, but there are no evidences of the existence of the great fleshy and gristly mass which is stuck on in front in life. This swelling of the front of the face in the skull slightly reminds us of a greater one which characterises the Dog-faced Baboons, and, moreover, the similarity is increased by the fact that the upper eye (canine) tooth presses the first tooth behind the lower eye tooth backwards. These little peculiarities are inherited gifts, for the Nasalis and the Baboon probably came from a common ancestor. Perhaps the great fleshy nose of the Semnopithecus Nasalis is a relic of the long face of the ancient Baboon. Shorten the bones of the Baboon's nose, and leave the soft parts, and there would be left something like the queer features of the Monkey now under consideration.

One must be struck with the long back-bone of this Monkey, its single backward bend, and the long way the ribs seem from the hips; making it like the Gibbons, and very unlike the other great Apes, which have their last ribs close to their hips. The tail is very long, and starts well up the back, that is to say, its origin at the end of the sacrum bone is some distance from the haunches, on which the creature sits. These last are rounded so as to afford comfortable rest, especially as they are covered by the callosities or pads. The feet are long from the metatarsal bones, and the great toe-thumb is accompanied by a long, strong, backward-projecting, and curved-up heel-bone.

YOUNG LONG-NOSED MONKEY.

The Dyaks call this Monkey the Kaha, for this is the sound which they make when in companies in the woods by the side of the swamps and jungles. There they live a restless life at sunrise and sunset, being quieter in the heat of the day, and crying out at each other. They have fine voices, thanks to their strength, and perhaps to their air sac in their neck, which may render oral sounds more resonant. They are active creatures, and bound from tree to tree, clearing from fifteen to twenty feet with ease.

Being very like extremely ugly humanity, the Dyaks consider them as degraded men, and they give an excellent reason for their human ancestors having left their habits and dwellings. They did not like to pay taxes, so they took to the woods!

It is said that when the ambassadors of Tippoo Saib came to Paris to urge the French to take up his cause against the British in India, they were immensely delighted with the Monkeys with the great noses which were preserved and stuffed in the museum, acknowledging them as compatriots. But as a matter of fact, specimens of this Monkey never had been and never could have been seen by these men, for it does not inhabit the peninsula of India. But it is a fact that when some specimens came over to Paris, preserved in spirits, they excited a wonderful commotion amongst the savans. Broderip was present, and saw one drawn forth, "looking like one of those horrible female fiends sometimes pictured in old woodcuts.

"Not uglier follow the night hag."

A celebrated French naturalist, who was present at the opening of the casket which contained this zoological jewel, was in raptures, and as the bust emerged he uttered an exclamation significatory of her paternity. We looked in vain for the young imps, which had probably escaped when their poor barrelled-up mother fell. It must be startling to look round in the wilderness of Borneo and behold one of these horrible visages peering, Zamiel-like, from behind the trunk of some dark tree! The impression left on the mind, however, is rather of the comical than of the terrible in its nature after

seeing these creatures; but one is obliged to admit that those who see a use in everything may be puzzled to account for this superfluity of nose, for this greatest of all noses does not appear to be like that of the Wolf in Little Red Riding Hood, "all the better to smell with."

But some philosophy may be got out of this nose, and it tends to humiliate the pretensions of those anatomists who can restore an animal if they can only get hold of a bone or two.

This nose is an anatomical excrescence: cut it off, and no bones are cut through; dissect the skull, and then no one could tell that there ever had been such a feature attached to it. The dry bones show no sign of what was during life, and the skull resembles those of the other Semnopitheci. So that animals with the same shaped bones may have very different coverings, and no one could restore the nose of this creature out of his inward consciousness any more than he could imagine, from the back-bones of the animals, that camels and dromedaries have humps thereon.

The animal has a huge air sac, which appears to be single, and to enter the windpipe above the larynx cartilage, and between it and the bone of the tongue. It opens into the membrane which connects these structures (the thyroid membrane) on the left side, and the opening can be closed by the contraction of the muscles which reach from the tongue-bone (os hyoides) to the larynx cartilage (thyroid cartilage—the thyro-hyoid muscles).

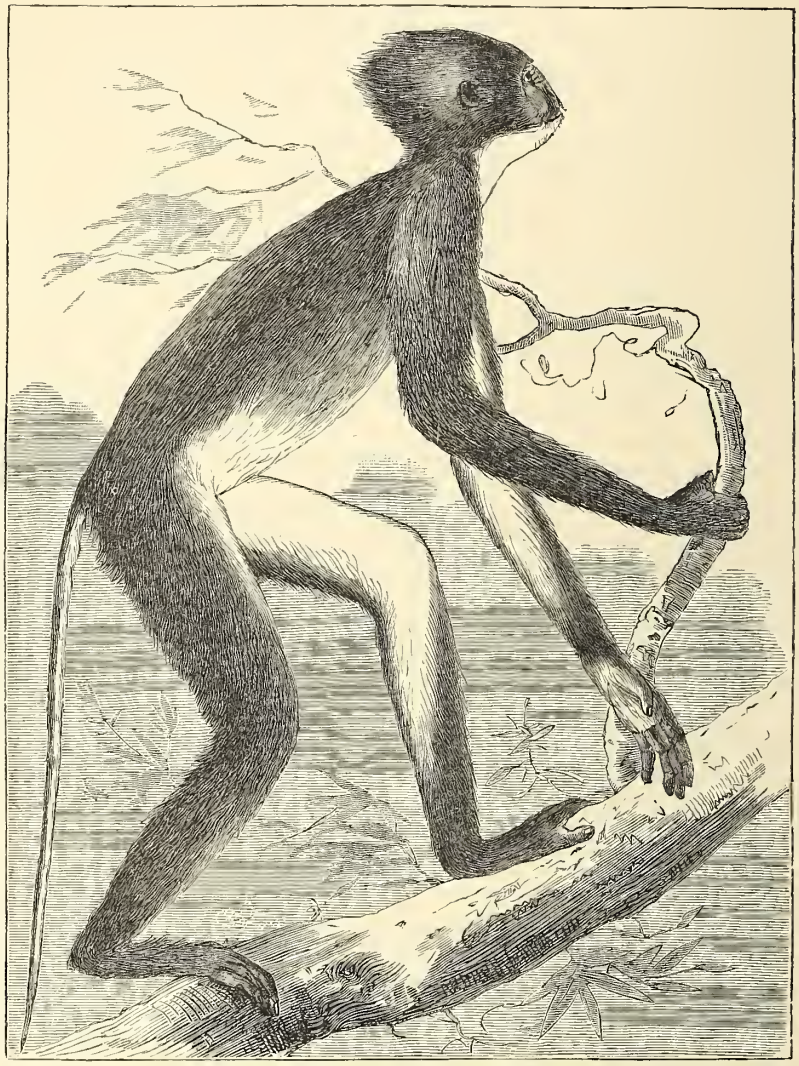
But the most interesting part of the internal construction of Nasalis is the great stomach, which does not consist of a simple bag, with an opening for the food to enter from the gullet and œsophagus, or food pipe, and with another at the opposite end to carry the digested food to the intestines, but is complex, there being three bags united together. The first two of these bags are for the storage and reception of food, and the other, which ends in the canal leading to the intestines, is for its digestion. This compound stomach is peculiar to the Semnopitheci and the Colobi amongst the Monkeys. It exists in the most perfect form in the animals which chew the cud or ruminate, such as oxen. It is noticed also, more or less, in the Cetacea, or Whale tribe, in the Sloths, in the Cony, or Hyrax, in the fruit-eating Bats of the genus Pteropus, and finally in some Kangaroo-like animals. It is possible that the Semnopitheci may bring back more food into the mouth and chew it again, or the first two expansions of the stomach may be really simple receptacles and storehouses grown in the place of the cheek-pouches; or the condition may be a reversion, or going back, to the condition of some remote ancestor.

OUTSIDE VIEW OF THE STOMACH.

The large intestine is also very bulged out here and there, and this and the large stomach occupy much space in the cavity of the belly, compressing the bowels within smaller bounds than in the larger Monkeys.

Bezoars are found in the sacs of the stomach of the different kinds of Semnopitheci, and were and may be still much prized. They are potent charms and remedies against poisons, and are supposed to possess extraordinary virtues. The name comes from the Persian, writes the learned author of the article "Bezoars," in the "Penny Cyclopædia"—*Pêd-zahr*, expelling poison, the expeller of poison. "Pêd" is relieving and curing, and "Zahr" is poison. Bezoars are sometimes found in various parts, but chiefly in the stomachs of land animals. They are either natural or artificial, and as they are rare, they are worth many times their weight in gold. Those which were most esteemed in Europe came from the East, and were the earliest used. The most highly prized came from the stomachs of the wild goat of Persia, and they were called by way of eminence, *Lapis Bezoar Orientalis*, and all such things which were supposed to be antidotes were called *Bezoardic*. They are still esteemed in the East, but have long fallen into disuse in Europe, the chemist and the naturalist having abolished their value by exposing their real nature. They are the round hard balls which are found in the stomachs of many animals, and which consist of hair licked off and swallowed, and food of every clinging nature cemented together by mucus. They get too large to pass out of the stomach, either by vomiting or by going through the small canal into the intestine, and therefore become round by being rolled about, and often very great. Very large ones are discovered in some horses which are found at work near flour

and bran mills. The Americans got theirs from the Llama, and they consisted principally of phosphate of lime. Perhaps the earliest of all physics was bezoardic, and it consisted of the heart and liver of vipers, pounded up for the benefit of the invalid. Fortunately, Bezoars disappeared from the list of useful drugs years ago, with the crabs'-claws, oyster-shells, powdered centipedes, and other medical delicacies with which our forefathers were drenched in good faith and *secundum artem.*



THE SUMATRA MONKEY. (*From Temminck.*)

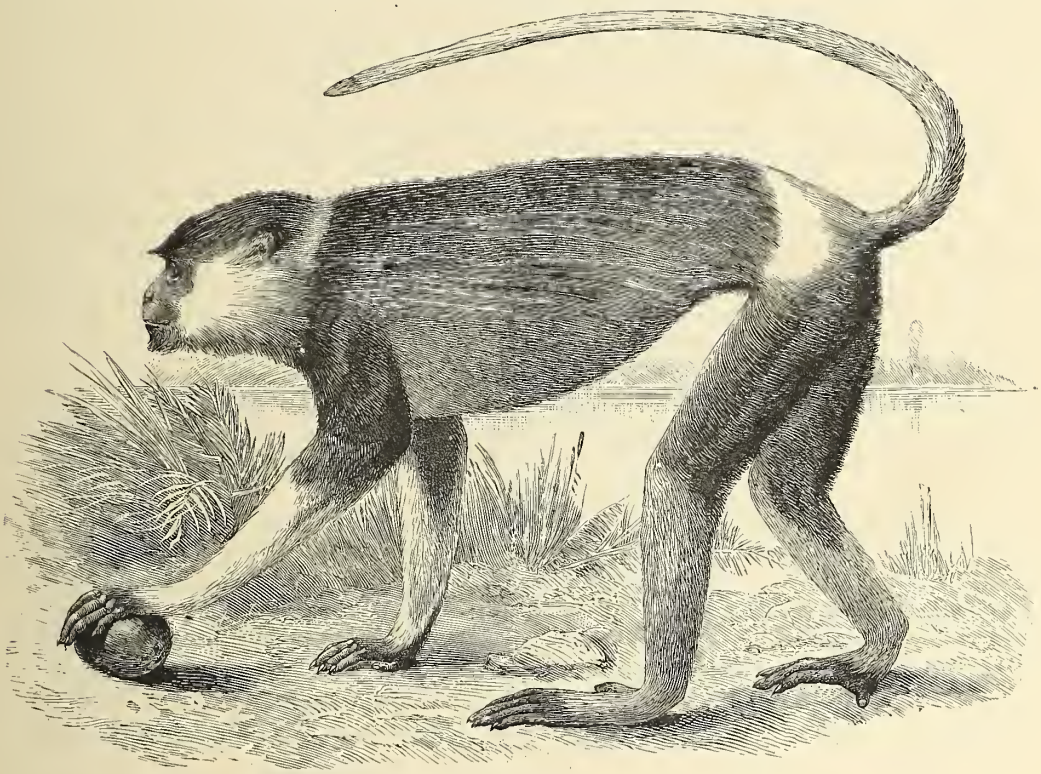
THE HOONUMAN MONKEY.*

This is the most sacred of the sacred Monkeys of the Hindoos, and when full-grown, measures four feet and a half in length, and the tail is considerably longer than the body. An ashy-grey tint distinguishes the upper part of the body, and it is darkest on the tail, which is of equal thickness throughout. The rest of the body is of a dingy yellow colour, or rusty brown, and the arms, hands, and feet are dusky black. The long face is blackish; and above the eyebrows is a line of long stiff projecting black hairs. A greyish-white beard passes round the face, and extends upwards, and is

* *Semnopithecus Entellus.*

thicker in front of the ears, which are long and prominent and black. Finally, this face has a few hairs by way of a beard beneath the chin, which projects.

A long-legged, active creature is the Entellus. It associates in great troops, and they keep up a constant noise and quarrel. Those that abound—thanks to the belief in their semi-divinity by the Hindoos—near towns and plantations are certainly more sharp, clever, and impudent than their less fortunate fellows. They watch and steal with impunity and ability, and are amusing when young, but savage and disagreeable when old. The young differ much in shape from the old adults, and their limbs seem very disproportioned at first. They have a staid look about them, and a tranquil eye, and the forehead is broad and high, the muzzle only slightly prominent, and the brain case large. But



THE DOUC.

with age this alters; the tints of the body get darker, the body larger, the muzzle elongates, and the forehead appears to contract, and to be no longer an object of human resemblance. The disposition changes also, for the tame and amusing young learn a number of tricks and are full of fun; but this is succeeded by a look and behaviour of distrust and fierceness.

The Entellus Monkey is not found from Cape Comorin to the Himalayan Mountains, as is usually asserted; and Captain Hutton has shown that it is "entirely and absolutely restricted, within narrow limits, to the hot tropical plains of the north-western Gangetic provinces, where, from the degree of protection which its imputed 'odour of sanctity' is so well calculated to cast around it, as well as from the numbers in which it frequently occurs, it becomes a perfect nuisance in those parts of the country where the superstitious veneration for it most strongly prevails. In many places where the natives, from religious motives, are in the habit of feeding and protecting them, the roofs of the village huts are at certain hours of the day literally crowded with them, and the depredations committed in grain shops, gardens, and among neighbouring crops, are most miscreant-like." The Entellus has been purposely introduced elsewhere, but is naturally confined to the right banks of the Ganges and Hooghly. They will not cross water of their own accord, and there appears to be a notion in the minds

of the Hindoos that if there are males on one side and females on the other bank of the river, and plenty of boats between, the sexes will never mix, but that the males have great fights together. This is, however, one of the many fictions of those races who rarely study Nature. Some of these Monkeys were introduced to Kishenagur, in Lower Bengal, across the rivers, by devotees, and the offspring of one pair increased to such an extent as to become a perfect nuisance, so that in 1867 a large number of the native community presented a petition, praying that measures might be taken by the municipality to destroy some of the too numerous Monkeys that infested the station, causing fearful havoc among the fruit and grain. An order was issued, and 500 were killed. "There must be many thousands," wrote a correspondent of the *Delhi Gazette*. This act was soon succeeded by another petition from a different section of the native population for the cancelment of the order to kill what they called their long deceased ancestors. The Entellus is not found in Africa, nor amongst the Himalayas; neither does it migrate from the upper to the lower districts of Bengal at special seasons. The Himalayan Semnopitheci are the Langoor and another—the *Semnopithecus pileatus* and *Semnopithecus barbei*.

It was stated formerly that the Entellus could be seen on Simla all the year through; but when the snow falls during the winter it seeks a warmer climate in the depths of the Khuds, returning again to the heights as it melts away. They may be seen, however, on a fine sunshiny day, even with the snow on the ground, leaping from tree to tree up and down a hill in Simla, which is at about an elevation of 8,115 feet. All this is a mistake; and it is the Langoor, not the Hoonuman, or Entellus, which does all this. It is the Langoor Monkey which Dr. Royle saw at an elevation of 9,000 feet during the summer months, and which Captain Hutton observed when on Hatu mountain, close to Simla, at an elevation of 10,650 feet, and at Simla during winter with snow four or five inches deep, and frost at night. The word is pronounced "Hănŭmāun."

Whether the Entellus is found in the Deccan, and to the south, appears to be matter of doubt; but probably the long-tailed Monkeys, seen in multitudes near houses or only in the forests, belong to a Semnopithecus closely allied in shape and ornamentation to it. One, the *Semnopithecus Johnii*, rarely leaves the forest lands, and is seen in Malabar.

Evidently the natives do not discriminate between the species and the varieties of it, as we may. They consider all of them possibly to be endowed with the mind of an ancestor, and that it may be their lot to have their soul placed within the body of some Monkey or other.

They attribute to the Hoonuman the stealing of the delicious fruit the mango, and its introduction into Hindostan; but the legend asserts that the hero Ape who did this, stole the fruit from the garden of a giant, who lived in Ceylon, and that afterwards he resolved to set fire to Ceylon, and destroy his enemies by a lighted tar-barrel tied to his tail; but he burnt his hands and feet black, and they remain so to the present day. Unfortunately for the truth of this legend, the Entellus never was in Ceylon.

The Entellus is occasionally to be seen in the Zoological Gardens of London, but it is a very delicate creature. It likes quiet play and some solemn stillness, and therefore it is not kept with the vivacious African Monkeys, but with the Long-tailed Americans.

One of the most striking of the Semnopitheci is wonderfully like some of the Indians of the far west of America in their war-paint, so far as the head is concerned. This is—

THE CROWNED MONKEY.*

Its colour is brown, becoming very dark and almost black on the back, loins, and outsides of the thighs, and around the fore-arms and lower leg. The muzzle is rather prominent, and there is a white patch over the nose on the forehead. The crest of long hair sticks up like that of a Cockatoo, and is rather brushed backwards, whilst a whisker, which is continuous with it, comes forward and hides the cheeks.

All the proportions of the limbs are those of the genus, and the tail, which hangs down, is long and slender. It comes from Borneo.

* *Semnopithecus frontatus.*

THE RED SEMNOPITHECUS.*

This is an active little Monkey, and a great tree climber; it greatly resembles the last in shape, but it has a shorter muzzle, and the whole body is a bright reddish-brown, the face being blue and naked, the eyes hazel. A crest of hair sticks up on the top of the head, and the bulk of it points backwards, whilst the front comes over the forehead like thatch, and the whiskers are brushed outwards. It is called Kalassi in Borneo.

This diversity of colouring, which must astonish every one who has seen Temminck's beautiful plates of the Semnopitheci, must be received cautiously as a proof of the different colours meaning different kinds. For in Semnopithecus Chrysomeles the male is dark brown, and only lighter in tint underneath, whilst the female is light brown, with a splash or two of black on the front legs. They both have blue faces. In this instance the female and the male might have been called by different names. The same thing occurs in the Sumatran Monkey, in which the female is light brown and the male is a most extraordinary-looking yellow. His hair seems brushed back most violently, the blue face is very short and straight; he has a reddish chin, a white throat, inside of arms, and legs, and belly, and under part of tail, but all the rest is black, with a shade of lighter tint behind the ears and on the back.

All these are very curious looking when young, for then the head appears too big for the body, and the stomach is always large; moreover, the little Proboscis Monkey looks like a boy with his hair parted down the front, and who has a blue face and a tail.

THE DOUC, OR VARIEGATED MONKEY.†

This Monkey is perhaps the most gaily clad of all this group, and in this departs in a most marked manner from the dull sameness of the fur of the Apes already described in the former chapters. Not only is the long hair very different in colour in several parts of the body, but the hairs themselves are variegated, having bands of various tints upon them, differing thus from the whole-coloured hairs of the great Apes.

The animal has the usual shape of the Semnopitheci; but the whiskers brushed back, as they appear to be, make the naked and orange-coloured face look broad. These whiskers are long, and are of glossy whiteness, and above they join the hair of the forehead, which is black in front, gradually becoming grizzled grey. This is the tint of the head, and of the back of the neck and back. The thighs, fingers, and toes are black, the legs and ankles are bright red, fore-arms, throat, and underneath the legs, the buttocks, and the tail are pure white, and the white throat is surrounded by a more or less complete circle of bright red. They live in the woods of Cochin China, and have been met with not far from the coast. They assemble in troops, but appear to be good tempered and easily frightened, and this appears to be all that is known of their nature. But they yielded to the researches of the anatomist the same internal arrangement of the cavities of the stomach which has been noticed in describing the Long-nosed Monkey.

THE BLACK-LEGGED DOUC.‡

The forests on the banks of the Me-kong, near Sai-gon, in Cochin China, are tenanted by a fine Douc which, instead of having the red legs of the true Douc (*Semnopithecus nemæus*), has them of a black colour from the root of the tail to the tips of the toes. Moreover, in this animal the fore legs are greyish-black, dotted with white, whilst those of the other Douc are whitish. Of course these distinctions are not sufficient to separate these Doucs specifically, and they must be considered races or local varieties, the black-footed one living more to the south than the other. If this be correct, and it must be on the principle that a negro and a white man are only races of the genus Homo, and that a black and a white rabbit are of the same kind, colour is a point of little importance.

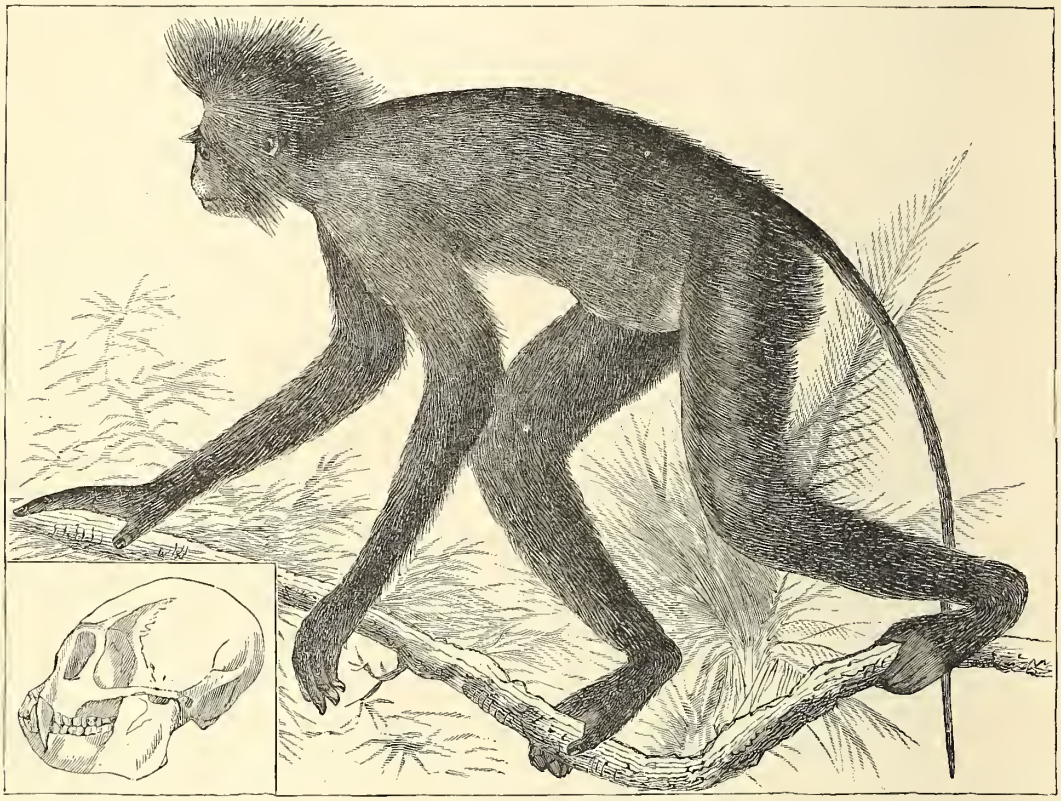
The Black-legged Douc has its face almost naked, and surmounted by a band of hairs on the forehead. These stand out, and are directed forwards. In the other Douc these hairs, of a less black

* *Semnopithecus rubicundus.* † *Semnopithecus nemæus.* ‡ *Semnopithecus nigripes.*

tint, are brushed, as it were, backwards. Now, an attempt has been made by Geoffroy St. Hilaire to arrange the kinds of Semnopitheci by the direction and peculiarities of their head-dresses, and if this plan were carried out the true Douc would be in one section—that of those with the hair brushed back, and the black-legged one, which is only a variety, and not a separate species, would have to be placed in another. Hence, this plan is worthless.

This Douc has a very human face and a small head, a large chest, a thin abdomen, very long hind-legs and tail, and short fore-legs.

The skull of the Douc has large and open orbits, faint side crests, and faint crests passing from the ear over the occiput. The face is small in relation to the brain case, and the shape of the



SEMNOPITHECUS FRONTATUS.

whole differs greatly from that of the Troglodytes in this respect. The lower jaw is angular behind, and the portion (the ascending branch or ramus) which leads up to the joint is very straight. The teeth in it are of the same number as those of the Gibbons; but the last grinder is long, and has a very distinct heel-like back, point, or cusp. The other four points, or cusps, are placed two in front and two behind them, those in front are united by a cross ridge, then comes a hollow across the tooth, and then the back pairs, which are united by a ridge, and then the heel follows. The other crushing molar teeth have four cusps, in pairs, each pair having a common cross ridge, and the pairs are separated by a furrow. The teeth are close together, and the first false molar is smaller than the second. The upper jaw projects a little, and the front jaw-bone (pre-maxillary) remains distinct. Its crushing teeth have four points, or cusps, but the outline of the teeth is not straight at the sides, but doubly curved, so that the entrance of the curves is between the cusps, and it corresponds to the furrow. All this gives a very animal look to the teeth.

It must be remembered that these teeth are used more for crushing soft vegetable matters than for cracking nuts, and things which can be stowed away in a check-pouch and devoured at leisure. Hence the difference between the teeth of these and of the Macaques.

THE CEYLON LOW-COUNTRY WANDEROO—THE WHITE-BEARDED MONKEY.*

"When observed in their native wilds," writes Sir James Emerson Tennant, "a party of twenty or thirty of these creatures are generally busily engaged in the search for berries and buds. They are seldom to be seen on the ground, and then only when they have descended to recover seeds or fruit that have fallen at the foot of their favourite trees. In their alarm, when disturbed, their leaps are prodigious, but generally speaking their progress is made not so much by leaping as by swinging from

THE PRIAMUS MONKEY. (*After Tennant.*)

branch to branch, using their powerful arms alternately, and when baffled by distance, flinging themselves obliquely so as to catch the lower boughs of an opposite tree, the momentum acquired by their descent being sufficient to cause a rebound, that sends then again upwards, till they can grasp a higher branch, and thus continue their headlong flight.

This Monkey is very active and intelligent, and is not very mischievous, and, indeed, is much less so than the other Monkeys of Ceylon. In captivity it is remarkable for the gravity of its behaviour, and for an air of melancholy in its expression and movements, which is completely in character

* *Semnopithecus nestor.*

with its snowy beard and venerable aspect. Its disposition is gentle and confiding; it is in the highest degree sensible of kindness, and eager for endearing attentions, uttering a low plaintive cry when its sympathies are excited. It is particularly cleanly in its habits when domesticated, and spends much of its time in cleaning its fur, and carefully divesting it of the least particle of dust.

The Nestor is about sixteen inches in length (the body and head), and the tail measures twenty inches. The prevailing colour is a deep grey, with a slight tinge of brown, becoming paler on the back of the neck and on the tail, where the previous tinge is more marked. The hands and lower part of the limbs are nearly black. Its lips, chin, and whiskers are nearly pure white, the tips of the latter, which are brushed backwards, being grey. There is a stiff ridge of black hairs over the eyebrows, and they are about an inch and a half in length. The moderate length of the hairs, the light colour and the white of the lower sides of the face, are distinctive. It inhabits the southern and western provinces of Ceylon, and is even found at a higher elevation than 1,300 feet.

THE MAHA, THE GREAT WANDEROO.*

This is a larger Monkey than the last, and lives in the hills higher up the country of Ceylon than the Nestor. It is wilder and more powerful than its lowland neighbour, and is rarely seen by Europeans. It clings to the deep woods, and seldom approaches the few roads which have been made through these solitudes. There is a good deal of the Bear in its general appearance, and Major Forbes, travelling in Ceylon, noticed this first of all. He says:—"A species of very large Monkey, that passed some distance before me, when resting on all-fours looked so like a Ceylon Bear that I took him for one." Hence the name Ursinus.

Another very rare Monkey in Ceylon is, for some hidden cause, named *Semnopithecus Thersites*. Thersites was the most ugly and the most impudent talker of the Greeks before Troy, and probably this Monkey is ugly and impudent in the extreme. It is deficient in the head-tuft, which adds to the beauty of the genus; but its temper is good, and it is grateful. One which was caught was fond of being noticed and petted, stretching out his limbs in succession to be scratched, drawing himself up so that his ribs might be reached by the finger, and closing his eyes during the operation, evincing his satisfaction by grimaces absolutely ludicrous. He was fond of fresh vegetables, plantains, and fruit, and ate freely of boiled rice, beans, and grain.

The last Ceylonese Monkey to be noticed is the *Semnopithecus Priamus*.

It inhabits the northern and eastern provinces, and the wooded hills which occur in those portions of the island. In appearance it differs both in size and in colour from the common Wanderoo (*S. Nestor*), being larger and greyer, and its habits are much less reserved. Where the population is comparatively numerous, these Monkeys become so familiarised with the presence of man as to exhibit the utmost daring and indifference. A flock of them will take possession of a Palmyra palm, and so effectually can they crowd and conceal themselves among the leaves that, on the slightest danger, the whole party becomes invisible on the instant. The presence of a Dog, however, exites such an irrepressible curiosity, that, in order to watch his movements, they never fail to betray themselves. They may be seen frequently congregated on the roof of a native hut; and some years ago the child of a European clergyman having been left on the ground by the nurse, was so teased and bitten by them as to cause its death. The Ceylon people, or the Shingalese, believe that the remains of a Monkey are never found in the forest—a belief which they have embodied in a proverb, that "He who has seen a white crow, the nest of the piddybird, a straight cocoa-nut tree, or a dead Monkey, is certain to live for ever." "This piece of folk-lore has evidently reached Ceylon from India," writes Sir J. Emerson Tennant, from whose work the extract is taken, "where it is believed that persons dwelling on the spot where a Hoonuman Monkey (*Semnopithecus entellus*) has been killed, will die, and that even its bones are unlucky, and that no house erected where they are hid will prosper. Hence, when a house is to be built, one of the employments of wise men is to ascertain by their science that none such are concealed; and Buchanan observes that it is perhaps owing to the fear of this ill-luck that no native will acknowledge having seen a dead Hoonuman."

Sir J. Emerson Tennant describes the method in which these Priamus Monkeys attack a garden,

* *Semnopithecus ursinus.*

which is quite after the fashion of modern human military tactics. A green sward separated the garden of one of his friends from the jungle, and across this a single Monkey would cautiously steal about twenty paces, and halt to assure himself, by eye and ear, that all was safe. Presently a second would venture out from the trees, pass in front of the first, and squat himself after making another reconnaissance. A third and a fourth would then stealthily approach, always gaining an advance beyond the last vidette, and finally the whole body, having ascertained the absence of danger, advanced hastily but noiselessly to the inclosure; and having with infinite rapidity secured a sufficient supply of fruit, the troop dispersed simultaneously, with a rush and an exulting scamper, conscious that caution was no longer necessary. Possibly this Monkey becomes occasionally an albino, for white Monkeys having the general shape of the Priamus are captured every now and then not far from Colombo; and Spence Hardy mentions, in his work on "Eastern Monachism," that on the occasion of his visit to the Great Temple of Dambool he encountered a troop of white Monkeys on the rock on which it is situated.

In the Semnopitheci and in the species of the next genus (Colobos) the face is long, the forehead rounded, and there is a decided angle to the jaw, so that the facial angle is considerable.*

GENUS COLOBOS.†

All the Monkeys of the genus Semnopithecus which have been found by travellers and naturalists live in Asia and its islands, and thus their geographical limit is precise. Now, there are some Monkeys which resemble them in most points, and which are only found in the forests of tropical Africa; that is to say, in Abyssinia on the east, and from Gambia to Angola on the west. They are also found on the Island of Fernando Po. These have the thumbs of the hands extremely small, and they are but mere useless projections. They are Semnopitheci without thumbs, and the Greek word κολοβός ("docked or stunted") has been used to designate them.

The kinds of Monkeys included in the genus Colobos are not very numerous, and they are interesting more on account of their beautiful skins, which form ornaments and articles of commerce in Africa, and for those suggestions which must occur to the mind of every one who thinks a little about natural history, regarding the cause of the absence of such an important structure as the thumb in a group of animals, whose other characters are similar to those of a genus possessing it. Very little is known about their habits in a state of nature, and few have ever been brought alive to Europe.

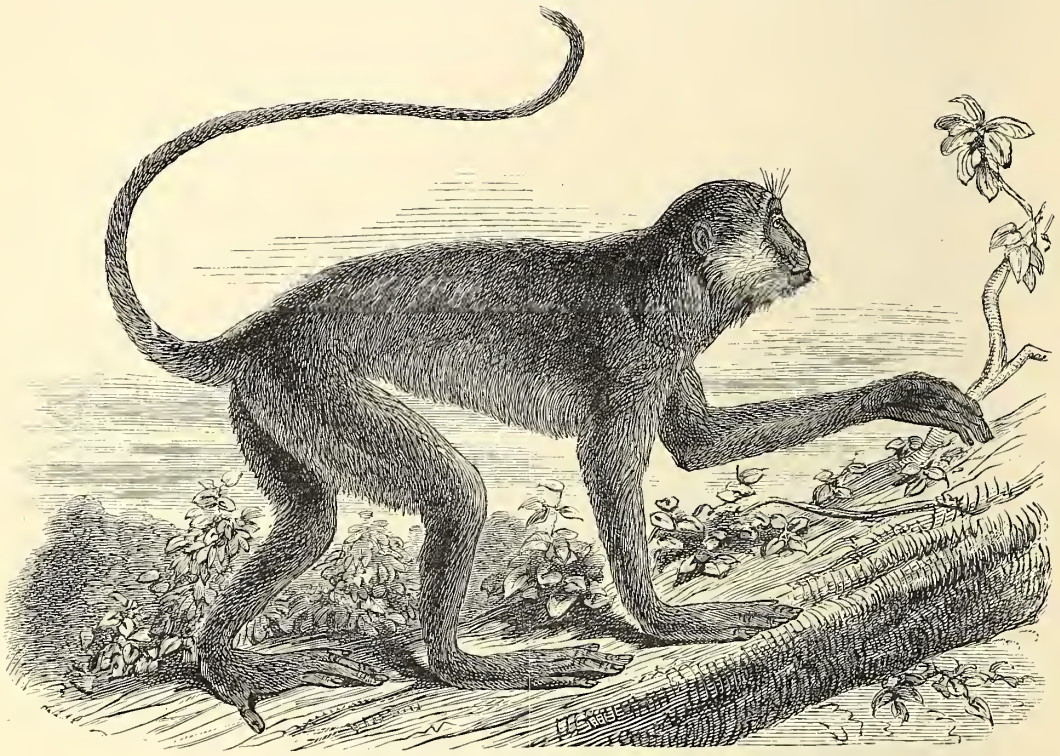
The thumb is not seen in the least in one kind of Colobos, the true Colobos (*Colobos verus*); in others it is like a little knob, but in none is it of any use. In the corresponding member of other Monkeys there are three bones, one placed before the other. The first, the metacarpal, is the nearest the wrist, and is jointed to the wrist-bone called trapezium, and in front it is in contact with the second bone, or the first phalanx of the thumb. This is ended by the second phalanx, which bears the nail. These are terms used by anatomists, and the word metacarpal means "the next in order of rank to the wrist." These metacarpal bones intervene between the knuckles and the wrist, and are long and parallel with each other, there being five in the hand. They are not usually very movable on the wrist, but that of the thumb is, and they have a joint at the further end which unites them with the so-called internode or phalanx-bone, No. 1. The word internode means between joints, and the term phalanx is one of those unmeaning applications of Greek terms which abound in anatomy. The phalanx was an order of battle, and means rows placed in parallel order: the internodes of the fingers, when in place, are one before the other and side by side, like the soldiers in the Greek order of battle. Each phalanx represents a bone: there are two in the thumb, and three in the other fingers. In the Colobos there is a joint on the wrist-bone for a thumb, but no thumb exists, but there is just a little vestige of a bone, and it is probably the first phalanx, or internode, and not the metacarpal.

The thumb is therefore "rudimentary" in the genus Colobos, and why? The animals are tree-climbers and active jumpers, and can run very well on all-fours; in fact, their method of life

* The kinds of Monkeys included in this genus have a very wide geographical range. Mr. Wallace states that a species has been seen at an altitude of 11,000 feet in the Himalayas; and *Semnopithecus roxellana*, which resembles a young *Semnopithecus nasalis*, occurs in Eastern Thibet (about lat. 30° N.) in the highest forests. Elsewhere, they extend over the forest land of the Oriental region of natural history.

† Thumbless Monkeys.

and of motion is that of the Monkeys which have well-formed thumbs. The notion of a useless organ is at first repulsive to our ideas of the benevolent scheme of Nature. Mr. Darwin writes, "In reflecting on them every one must be struck with astonishment; for the same reasoning power which tells us plainly that most parts and organs are exquisitely adapted for certain purposes tells us with equal plainness that these rudimentary or atrophied organs are imperfect or useless." Let us take a well-known instance of such a structure: the Calf when born has cutting teeth in its upper jaw hidden in the gum; they are not in sockets, and even if they were, they would be of no use in biting. The Ox has no cutting or incisor teeth in its upper jaw, as every one knows, and the tongue touches a hard and moist gum there. The incisor teeth of the Calf are never cut, but they are gradually absorbed in the gum with age. Now what is their meaning? They are of no use in sucking, or in



COLOBOS VERUS. (*After Van Beneden.*)

anything which occurs in the early life of the animal: they are clearly useless and rudimentary or atrophied structures. Take another example: the little Kiwi bird of New Zealand has no wings with which to fly, yet the bones are there in a dwarfed and rudimentary condition; many insects have no wings, or have them so reduced in size that they are of no use in flight, and sometimes the males have them in perfection, and the females have none. In explaining this subject two courses are open, first, to beg the question, and to say that the design of the Creator was thus; or to account for it on the principle that the Creator acts by law, and that creatures become modified and altered by inherent power, and by having to obey the force of surrounding circumstances generation after generation.

In the instance of the male and female insect just noticed, the male is active, and has to search for his partner, and the female is a stay-at-home, and expects to be courted, and when mated to do nothing more than lay eggs. Her wings would be of doubtful value. We may believe, then, that *disuse*, generation after generation, gradually weakened the wing, and finally Nature, ever economical in not-used organs, did not perpetuate it. Disuse may be therefore considered as the principal cause of the atrophy, rudimentary condition, and of the final deficiency of structures. But disuse will not produce this in one generation, but in many, so it is necessary to look farther back into the ancestry of

the creatures which have rudimentary organs. The four-legged ruminating or cud-chewing animals have bones and feet of peculiar arrangement, and there is no difficulty in at once knowing a ruminant by its bones. Now, in former ages, and before there was a trace of man on the globe, there were ruminants, as known by their bones, found in strata or deposits, and they had incisor teeth in their upper jaws when full grown, and not only when in the calf condition. The inference to be drawn is, that the modern Oxen are the descendants of those ancient forms with incisor teeth, and that disuse, probably produced by the introduction of grass-feeding on a grand scale, instead of leaf and bud-nibbling, gradually diminished the strength and permanence of the front upper teeth, and finally only left the simple traces of them which we have mentioned. Disuse by ancestral forms, by the forefathers, and the carrying down the weakened and atrophied state of the structure or organs,

THE GUEREZA.

are the most important considerations in any attempt at the explanation of the seeming paradox. In endeavouring to apply this style of reasoning to the Colobos group—the Semnopitheci without thumbs—it must be asked, is there any evidence of the great antiquity of these Monkeys, and are there any evidences of anything wrong about the thumbs of their Asiatic allies?

It is remarkable, and bears strongly upon this point, that some of the fossil remains of animals found in India, on the flanks of the Himalayan Mountains, have a greater resemblance to a large Semnopithecus Monkey than to any other, and to one belonging to a kind greatly like the Entellus. The bony remains were found in collections of shingle, clay, and sand of great depth, and which included also the remains of the bones of Elephants, Giraffes, Hippopotamidæ, Crocodiles, and fresh-water Tortoises, and other land and fresh-water creatures. The deposits had accumulated in lakes and swamps in the plain near the distant flanks of a low range of hills, the ancient foundations of the present great snowy range, and then upheaval took place, which gave the very home of snow (Himalaya) its present vast altitude. The plains, lakes, and swamps were lifted up and tilted, and their relics are now found resting at a considerable angle on the main chain, and covered and folded over by the pressure exercised during the marvellous change in the physical geography of the district. Semnopitheci lived in India, then, before the Himalayas were a great chain of mountains, and they lived with animals which were African as well as Asiatic in their character. The vast age of the

groups of Monkeys must be admitted, for the Himalayas are as old as the Alps, and as both have been worn down into their present condition of peak, pass, and valley since they were uplifted, their age is incalculable by years. The former connection of Africa and Asia by means of intermediate land, which is now the floor of the Indian Ocean, to the west of Hindostan, may be reasonably asserted to have been severed at the same time when the mountains far away to the north-east received their breadth and height. So that before these great terrestrial changes occurred, Semnopitheci could have either an Indian or an African home. Disuse of the fore-thumbs in branch-crawling or swinging may then have commenced before that geological age in which these things happened, and it may have progressed very decidedly in Africa, and not so much in Asia. Hence the Semnopitheci here have rather small thumbs, and the African groups, separated by the physico-geographical change, and disusing generation after generation, have gradually lost the structure.

The Colobi resemble the Semnopitheci in the construction of their compound-looking stomach.

THE GUEREZA.*

There is something very un-monkey-like in the shape of this Abyssinian animal, for it has long white hair, resembling the edge of a cloak, along its sides, and a long tail with a tuft to it. The natives chase it, and are fond of having some of their long hairy skins to cover their shields with. Assembling in little troops, the Guereza keeps well up in the tallest trees, in the neighbourhood of running water. They feed on fruit, grain, and insects, and are inoffensive and wild. The fur is certainly very prettily arranged, and the black and white truly oppose each other well. The colour of the fur of the head and of the greater part of the body is black, but the forehead is white, so are the sides of the face, the throat, and the sides of the neck. There is a mantle-like mop of long hairs starting from the region near the ribs, and the lower part of the back, and covering the flanks in a train behind. It is of a white colour, and exists in both sexes; nevertheless, it is longest in the females and adults. The tail is white, hairy, and tufted.

Another of the Colobi has a very dignified look given to it by a large mass of hair which covers its neck and shoulders like a little cloak. It has slim legs and a long tail. For some reason or other the natives in the neighbourhood of Sierra Leone call it the King of the Monkeys. The face and limbs and body are black, and a great mass of hair starting from the forehead and brushed back from the sides of the face and chin, the neck and shoulders all round, falls down on all sides. This is of a dusky yellow colour. The tail is white. It is called the Cloaked or Many-haired Colobos (*Colobos polycomos*).

As if to contrast kinds of the genus Colobos, which have great general resemblances, Nature has provided some with red-coloured fur, instead of black and white; for instance, the Bay Monkey (*Colobos ferrugineus*); and finally, one very interesting species which, like all those mentioned, except the Guereza, come from West Africa, has a short fur of an olive colour, but with a grey tint beneath and on the limbs. It has no long hairs on the body, and its tail is long and thin. This *Colobos verus* has not a vestige of a thumb. There are eleven species of this genus.

Besides the fossil Semnopithecus found in the Himalayas others have been discovered in Greece, Wurtemberg, and at Montpellier, and in strata of Mid-Tertiary and of Pliocene Age.

* *Colobos Guereza.*

CHAPTER VI.

THE DOG SHAPED MONKEYS (*continued*)—3. THE GUENONS.*

THE GUENONS—Where they are Found—Early Notices of them—Resemblance to the Colobi and Macaques—Distinctive Peculiarity of the Group—Often seen in Menageries—Their Terror of Snakes—Peculiar Expression of the Face—Beauty of their Skins—Minor Divisions of the Guenons—THE DIANA MONKEY—Origin of the Name—Anecdotes of their Mischief—THE MONA MONKEY—Description of one at Paris—THE WHITE-NOSED MONKEY—Origin of the Name—THE TALAPOIN—Anatomical Peculiarities—THE GREEN MONKEY—Found in Senegal in abundance—THE RED-BELLIED MONKEY—THE RED MONKEY—Observed by Bruce—THE MANGABEY—Singularity of its Appearance—Special Structural Peculiarities.

THERE are vast numbers of Monkeys living in the African forests which resemble, to a certain extent, those described in the last chapter, but which have such important differences in their construction that they are separated from them, and collected in another genus. They are said only to range in Abyssinia to the Zambesi and from the Gambia to the Congo, but probably all the equatorial parts of the Continent are frequented by them, and they extend far south. They are not found in Madagascar, and, of course, they do not frequent desert places or rocky treeless districts.

Being very numerous, and extremely impudent, as a rule, and full of grimace and mischief, they soon attracted the attention of the ancients, and the beauty of the fur of some made them all the more prized. Hence they were caught, figured, and sent as presents to distant kingdoms. The ancient Egyptians knew of one, which at the present time is found in Nubia, and which is often brought to Europe, being called the Grivet. They engraved it in the catacombs of Gyzeh, whence the figure was described by Denon, and Ehrenberg and De Blainville have drawn it as represented mounted on the long neck of a Camelopard. Many coloured drawings of Egyptian origin also represent a Monkey on all-fours, with a tail curved over its back, and this is probably one of those about to be considered.

They are still called *Keb* or *Kep* in the East of Africa, and they are doubtless the κῆβος of the Greeks. Aristotle says for certain that the Cebus, as it was translated by the Latins, is an Ape with a tail (ἐστὶ δέ μέν κῆβος πίθηκος ἐχων οὐρὰν).

Modern naturalists, having become acquainted with many of these species closely resembling each other in some important particulars, have arranged them all under the term Cercopithecus from κέρκος (a tail), and πίθηκος (an ape). The grimaces and odd gestures of these Monkeys have given to them the name of Guenons, and this term is now used accordingly.

At first sight they resemble the Colobi, inasmuch as they have long bodies, long hind legs, and long tails, but the fore limbs are short in the Guenons, and the tail, which is as long or longer than the body, is stout and not slender. Moreover, they have well-made and exceedingly useful cheek-pouches, besides the callosities behind. The face of the Guenons is long, and rounded, and the eyes are somewhat prominent. On examining the inside of one of these particularly African species the stomach is found to be single, and not to resemble that of the genera last described, and on looking at the lower jaw it will be found that the last crushing teeth on each side have only four points, or cusps, and not five, as in Semnopitheci. The wearing of the first premolar tooth next to the lower dog tooth, and behind it, resembles somewhat that noticed before, and which will be described in treating of the Inui, or Macaques, in the next chapter. The hands and feet are well grown, and the thumbs are long and useful.

So that the distinctive peculiarity, or what is called the *diagnosis* of the group, or genus Cercopithecus is—Monkeys with long hind and short fore limbs, and with long tails, cheek-pouches, single stomachs, and callosities, there being only four cusps on the last lower molar teeth.

Many of the Guenons are often seen in menageries and zoological gardens, or as the more or less unwilling companions of organ grinders; and their trick of crowding everything into their mouth,

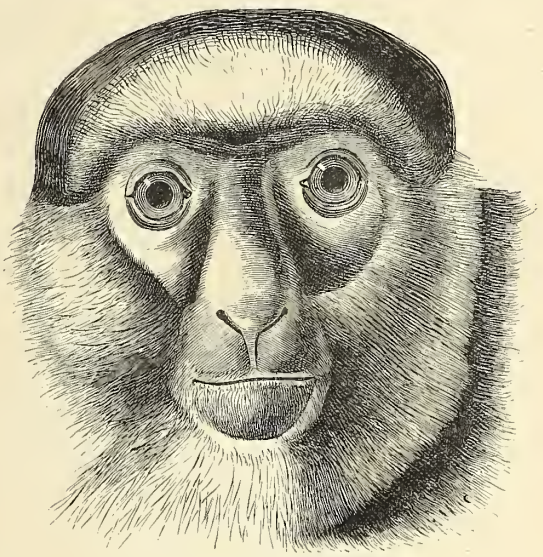
* *Cercopithecus.*

and allowing it to distend the cheeks, is sure to be noticed. The quantity of nuts which can be stored away is enough for a good meal; and hence these Monkeys are not only good purveyors for themselves, but great robbers of the riches of cultivators. In the wild state they assemble in troops in the forest, for they are essentially tree dwellers, and make raids on all sides of their favourite home, moving with such rapidity under the shadow of leaves and boughs that they are rarely seen by men. In their own little tract of forest they are very noisy and restless; they chase away in a body all intruding Monkeys, and whilst the more aged spend their time in more or less restless movement, in occasional family jars,

THE DIANA MONKEY.

and in picking the insects from their young and from each other, the juvenile part of the troop are full of play, mischief, and wanton aggression upon the quietude of their elders. A Snake may appear, and there is a terrible noise made, and a general rush off out of danger, the little ones clinging to the fur of the mother, and being carried off safely in spite of her bounds and jumps from tree to tree. Or a Leopard may make a spring, and not always fruitlessly, and great is the surrounding howling and grimacing at it. The hatred of Snakes is carried into their captivity; and Mr. Darwin having read Brehm's account of the instinctive fear which his Monkeys had of Serpents, and also of their great curiosity regarding snake-like things and their doings, took a stuffed Snake to the Monkey-house of the Zoological Gardens. The excitement which was produced, he writes, was one of the most curious spectacles ever beheld. Three species of Cercopithecus were the most alarmed. They darted about their cages, and uttered sharp cries of danger, which were understood by the other Monkeys. A few

young Monkeys and an old Anubis Baboon alone took no notice of the Snake. He then placed the stuffed specimen on the ground in one of the larger compartments. After a time all the Monkeys collected round it in a large circle, and staring intently, presented a most ludicrous appearance. They became extremely nervous, so that when a wooden ball with which they were familiar as a plaything was accidentally moved in the straw under which it was partly hidden, they all instantly started away. These monkeys behaved very differently when a fish, a mouse, and some other new objects were placed in the cage; for though at first frightened they soon approached, handled and examined them. He then placed a living Snake in a paper bag, with the mouth closed loosely, in one of the larger compartments. One of the Monkeys immediately approached, cautiously opened the bag a little, peeped in, and instantly dashed away. Then he witnessed what Brehm has described, for Monkey after Monkey with head raised high, and turned on one side, could not resist taking momentary peeps into the upright bag at the dreadful creature lying at the bottom.



FACE OF THE DIANA MONKEY.

It would appear as if Monkeys had some notion of zoological affinities, for those kept by Brehm exhibited a strange though mistaken instinctive dread of innocent Lizards and Frogs.

Birds of prey attack them, and not always with a successful result; and there is a story of a little Guenon being darted at by an Eagle, who swooped down and struck it, but it did not get off, for a rush was made against the bird by several of the active elders, and they not only held it, but nearly plucked off all its feathers, so that when it got away it remembered for ever after the treatment it received. The Guenons are very choleric, and the expression of the face and of the mouth, and the shrill sounds which are emitted when they are angered, would probably be accompanied by extremely bad language were they men; but their rage is soon over, and some mutual tail-pulling and biting are the worst part of it. There is a curious defiant look about the eyes of some, with or without extreme restlessness of them; they seem to be the very embodiment of cunning and sharpness, and this look is really very peculiar to the group. By way of additional force of expression, those which are very fond of fighting with their teeth have the power of drawing back their ears like angry Dogs; and this is done by the action of a muscle which springs from the ear-bone behind the ear, and is attached to it behind. There is just a rudiment of this muscle in man. Usually very good tempered when young, like all the Quadrumana, they grow cross, savage, and uncertain in temper when old; there are some exceptions to this, but, on the other hand, so savage do some of them become, that breaking or removing their great upper canine teeth appears to be the only way of making them behave at all properly. The loss of these fine weapons of offence has a most humiliating effect on the most insolent and petulant of them. Many are very pretty, and are as elaborately coloured as the Douc, that prince of beautiful Semnopitheci; and this leads to their destruction, for every now and then, besides the native desire to have some fine Monkey skins, European ladies desire Monkey muffs, and many an irascible chatterer out of the woods of Western Africa has its skin paraded by the fashion. Bright red, green, fawn, yellow, and white colours are constantly mixed up with black shades, and every tint of grey is dotted here and there. The hair is longer in some parts than in others, especially about the cheeks and chin; one has a white spot on its nose, another has white moustaches, and a third a white band across the forehead. And these tints, and the disproportion of the long hairs, have served to identify the different kinds.

The Guenons occasionally breed in menageries, and thus opportunities have been afforded of

watching their treatment of, and method of educating, their little ones. One in Paris had three baby Monkeys, one after the other, and succeeded in rearing one, the others dying. She constantly carried it, holding it close to her, so that its little mouth was always close to the breast; but after a while, as it became stronger, it clung on by itself, holding on fast with its hands to the mother's fur, and helped itself whenever it thought fit. Then the mother appeared to pay no especial attention to the little one, and jumped and rushed about as if it had not the little burden. The father was anything but paternal, and boldly neglected the education of his child; in fact, he was quite indifferent to the mother as well, and even behaved brutally by seeking to quarrel with her. Once or twice he maltreated her, and pinched the baby, so he was locked up by himself.

This careless treatment doubtless accounts for the rapid independence of the young of the Guenons, who soon retaliate on their fathers and mothers for all the enjoyments they did not have at their hands, by endless teasings and scoldings. But all Monkeys are not thus unpaternal and unnatural, and the Baboon is singularly affectionate. At the time that the Grivet—the abovementioned Guenon—was seen in one cage outraging all good feeling, two Chacma Baboons were in another, and the difference in their behaviour was most edifying. In the one cage sat the solitary mother and its offspring, the father having been removed for his bad temper and brutal conduct; and in the other were several male Baboons surrounding two Baboon mothers and their two little ones, caressing the mothers with the most pronounced evidences of tenderness of feeling, taking them in their arms and pressing them to their hearts, and embracing them in a manner quite human. They squabbled about who was to have the pleasure of carrying the Baboon babies, and after having passed them from one to the other, returned each one to its own mother.

As these Guenons walk on all-fours and but rarely take on the erect posture, which, moreover, they cannot maintain, their muscles are not exactly the same as in the Troglodytes and Orangs, but they resemble those of the Semnopitheci. The Guenons, like the Macaques and Baboons—those great runners on all-fours—have a special muscle to assist in pulling the shoulder-blade forward, and thus to assist the forward motion of the body. Then, in order to drag the elbow backwards in moving on all-fours, and to assist also in climbing, one of the large muscles of the back sends a slip to the back of the elbow. Climbing is also assisted by an addition to the gluteal or buttock muscles, which is called the scansorius or climbing muscle. And in the foot the front muscle of the leg has two masses; one sends a tendon which goes to the inner and front bone of the ankle, and the other right under the foot to the inner side of the long bone (metatarsal), which supports the toe-thumb.

The result of its action is to turn in the foot with a view to holding on. Finally, the two long muscles which flex or bend down the toe-thumb and the other toes are not separate, but are connected by their tendons. So that there is not great independence of the toe-thumb, but all the toes act more or less simultaneously very readily. But the other muscles of it give it more mobility than in man. Their muscular energy is immense, and their power of using the thumb is very considerable, and they pick out each other's vermin with well-known ease.

In separating the numerous kinds of Guenons into kinds or species, paying a good amount of attention to their internal as well as external structures, that is to say, to their teeth and skull, as well as to their form, it becomes evident that some large ones form a group which closely resemble the others, but which still have more general likeness to the Monkeys which form the subject of the next chapter—the Macaques. These have been placed in a separate genus, but the necessity for doing so is not apparent, especially when the remarks made in the Introduction upon the true nature of classification are comprehended. So the so-called genus Cercocebus (κέρκος, tail; κῆβος, monkey) is omitted, and the Monkeys included in it by some authors are to be considered as the kinds which link on the Baboons and Macaques to the Guenons. Besides these, some Guenons are stronger and stouter than others, their skins being green, or tinted more or less with that colour, and another is of a bright red colour. So that several sets of the Guenons may be established for the sake of convenience—1. The smaller kinds usually with prominent white markings. 2. One having a green skin and a black nose, and only three points or cusps on its hind lower molars. 3. The larger kinds with decidedly green tints, one being bright red. 4. And the group often called Cercocebus, which resemble the others, but have a fifth cusp on the last lower grinder on each side.

Amongst the first kind the Diana Monkey is very well known, and visitors to the Monkey-house in

the Zoological Gardens in the Regent's Park usually pay much attention to this most determined and pretty romp.

THE DIANA MONKEY.*

This native of Western Africa inhabits the woods of the Guinea Coast, and of the banks of the Congo, and it is found in the island of Fernando Po. It was known to European naturalists before the year 1700, and it has always been prized for its pretty fur and gay temper.

The goddess Diana has been honoured by being associated with this Monkey on account of a crescent-shaped white band of long hair stretching across the forehead (she being goddess of the crescent-shaped moon). It is about eighteen inches long when full grown, and the tail is longer than the body, and the fur is very pretty. The crescent of white hairs has dark edges, and the top of the head is broad and dull grey, spotted with green; the ears are dark and the face also; and the beard and whiskers are white, and the first of these projects like a goat's. The broad and upper chest is white, and this colour is continued under the arms, which at their termination are black-grey. The middle of the back is a dark red-brown, and the belly is white with orange tints, and these colours are continued down the inside of the thighs. Outside these and the flanks are ash-grey and greenish. As another Monkey from the same region has a white band across the forehead, the Diana has been confounded with it, and hence very different descriptions of the colouring will be obtained by reading different authors, and even F. Cuvier jumbled the Diana and this Diadem Monkey together. Very little is known about them in their wild state, and in captivity they show very adverse dispositions; sometimes they are gay and full of fun, and at others morose and snappish. We once saw one of them in its cage in the Zoological Gardens pull its mate, a small Sykes' Monkey, from the top to the bottom by a well-directed pull of the tail, and the proceeding reminded one of a very energetic mistress, whose servants were inattentive, tugging at a bell-rope. The puller was chattering and grimacing at his visitors all the time that the pulled was hanging on to everything that came in its way during its forced descent; and when it came to the bottom it scrambled about and rushed up to its little house again as if it were a frequent and unwilling exercise. The Diana also stole its companion's food, such as a piece of apple, by putting her arms around its neck, and squeezing the morsel against its nose, so that it was obliged to drop it.

Mrs. Bowditch, in describing her voyage home from Western Africa, gives an interesting account of a Diana Monkey which was on board. "We made acquaintance," she says, "very suddenly, and, to me, disagreeably, for I had not till then conquered the foolish aversion with which these animals always inspired me. It was a dead calm, the wheel was lashed, and all, save myself, below—nothing round us but sea and sky, and I had sheltered myself with a book in a corner protected from the equatorial sun. Suddenly, and without noise, something leaped upon my shoulders, and the tail which encircled my throat convinced me that Mr. Jack was my assailant. My first impulse was to beat him off, in which case I should probably have received some injury; but fortunately I sat perfectly still, and twisting himself round he brought his face opposite to mine and stared at me. I endeavoured to speak kindly to him, upon which he grinned and chattered, seated himself on my knees, and carefully examined my hands. He then tried to pull off my rings, and was proceeding to a bite for this purpose when I gave him some biscuit which happened to lie beside me, and making a bed for him with a handkerchief he settled himself comfortably to sleep, and from that moment we were sworn allies. The amusement afforded to me and others by Jack made him tolerated when his mischievous propensities would otherwise have condemned him to perpetual confinement. He was often banished to an empty hen-coop, but as this made no impression upon him I always tried to prevent it, which he knew so well that when he had done wrong he either hid himself or sought refuge near me. Much more effect was produced by taking him within sight of the Panther, who always seemed most willing to devour him. On these occasions I held him by the tail in front of the cage, but long before I reached it, knowing where he was going, he pretended to be dead—his eyes were closed quite fast, and every limb was as stiff as if there were no life in him. When taken away he would open one eye a little to see whereabouts he might be, but if he caught a glimpse of the cage it was instantly closed, and he became as stiff as before. He clambered into the hammocks, stole the men's knives, tools, handker-

* *Cercopithecus Diana.*

chiefs, and even the nightcaps off their heads, all of which went into the sea. When biscuit was toasting between the bars of the caboose, and the dried herbs boiling in the tin mugs, he would take the former out and carry it away, and take out the latter and trail them along the planks; if he burnt his hands he desisted for a day or two; and he often regaled the Parrots with the biscuit, biting it in small pieces, and feeding them with the utmost gravity. At other times he would knock their cages over, lick up the water thus spilled, eat the lumps of sugar, and pull the birds' tails: and in this manner he killed a beautiful green Pigeon belonging to the steward, a specimen of which I never saw in any collection. For this he was flogged and imprisoned three days; and half an hour after he was let out I met him scampering round the deck with two blue-faced Monkeys on his back, which he often carried about in this manner. When he thought fit to ride, he would watch behind a cask on the days the Pigs were let loose, dart on to their backs as they passed, dig his nails into them to keep himself on, and the faster they ran and the more they squealed the happier he seemed to be. His most important misdemeanours, however, were performed to the injury of his fellow Monkeys, of whom he was very jealous. The smaller ones were very obsequious to him, and when he called them by a peculiar noise, they came, hanging their heads and looking very submissive, and in one week two were drowned out of sheer malice. I saw him throw the first overboard, and the poor little thing swam after us some time, but the ship was going too fast for even a rope to be effectually thrown out in the hope he would cling to it. During one of the calms we so often met with, the men had been painting the outside of the ship, and leaving their pots and brushes on the deck, went down to dinner. No one was above but myself, the helmsman, and Jack. The latter beckoned and coaxed a black Monkey to him; then seizing him by the neck, took a brushful of white paint, and deliberately covered him with it in every direction. The helmsman and I burst into a laugh, upon which Jack, dropping his victim, flew up the rigging into the maintop, where he stood with his black nose between the bars peeping at what was going on below. The little metamorphosed beast began licking himself, but the steward being summoned, he washed him with turpentine, and no harm was sustained. Many attempts were made to catch the rogue aloft, but he eluded all, and when he was driven down by hunger, he watched his opportunity and sprang from one of the ropes on to my lap, where he knew he should be safe. I fed and interceded for him, so he escaped with only a scolding, which he received with an appearance of shame which in him was rather ludicrous."

THE MONA MONKEY.*

The term Mona means tailed Apes or Monkeys, and it has been especially given to one from Senegal, which has some resemblance to the Diana, and it is mentioned here with a view of illustrating its mental peculiarities. They are more beautiful in colour and more elegant in form than the Diana, and they are sometimes more gentle, sagacious, and sharp than any other kind. F. Cuvier describes one which was a great favourite in the collection at Paris. Upon his arrival he was extremely young, and his gentleness and total want of malice and petulance gained him the free range of the apartment. Age did not alter the excellence of his disposition; and as he increased in age and strength, his address and agility became unparalleled. Yet all his motions were gentle, and his actions circumspect; he was persevering in his wants and wishes, but never violent in the attempt to enforce them. When after much solicitation his requests were refused, he would go off in a gambol, and find entertainment in some new object. He had no idea of property, but took every thing that pleased him, even such articles as had previously caused him punishment, and he committed his thefts with dexterity and silence. He would open locks wherein the key had been left, untie knots, open the links of a chain, and search pockets with so much address that you did not feel his hand there, although conscious of the fact that he was thieving. The examination of pockets was his favourite occupation, doubtless from expecting to find food. He was not very affectionate, but when tranquil, and not engaged, he received caresses with pleasure. When tempted to play he signified his assent by many graceful motions; he would throw himself into all sorts of graceful attitudes, bite gently, press himself against you, and give out a gentle cry. He never made grimaces, but, on the contrary, his countenance was always calm, and frequently serious. He looked a perfect angel of a

* *Cercopithecus Mona.*

Monkey in his beautiful fur; his hair was of a brilliant golden green, the back and sides were rich brown, variegated with black, the outer part of the limbs and tail were slate-coloured grey, while the neck, chest, and underneath were pure shining white. He had ears and hands of a flesh-colour, and there was a black band stretched across the forehead, surmounted by a crescent-shaped stripe of grey.

Probably its French education may have had something to do with its politeness and gentleness, for one of these pretty creatures which was kept in the Zoological Gardens was one of the most ill-

THE WHITE-NOSED MONKEY.

conditioned savage beasts ever seen—quite a diabolical Monkey. This Monkey does not appear to have the air sac in the neck which is common to the Guenons, as well as to the other Monkeys already noticed.

THE WHITE-NOSED MONKEY.*

The word "petaurista" is the Latin for "one that showeth tricks of activity, from a machine suspended," according to old dictionaries, so this Monkey with a white nose has its abilities properly designated. Some call it the Vaulting Monkey, but in the Zoological Gardens its wonderful agility is shown by its scampering up the side, over the top, and down the opposite side of its cage in a kind of continuous somersault. Coming down on all-fours with a bang, it does the same thing over and over

* *Cercopithecus petaurista.*

again to attract attention, and it seems as if it were moving in the inside of a wheel. The dab of white on the nose distinguishes it, and it comes from that paradise of Monkeys the Guinea Coast and the adjoining districts.

The only one of the second group to be mentioned is

THE TALAPOIN.*

This is a rare animal, and probably comes from the west coast of Africa, having been sent to Europe from the Gaboon. It is a pretty little creature (probably the smallest of these Monkeys), and is extremely gentle and intelligent. The skin is green, and the lower part of the body and the under part of the limbs are white. It has large ears, a black nose, and it has a kind of broad brutus on the forehead.

There are some very interesting points about this little thing, which, in nearly all its construction, is like the rest of the Cercopitheci, or Guenons, but it has a large brain, a short muzzle, a thick, long partition in its nose, and only three points, or cusps, instead of four, on its last lower hind grinders.

THE HEAD AND SHOULDERS OF THE TALAPOIN.

So far as is known, there are no differences between the habits of this little Monkey and the others from the west coast of Africa, and therefore its intelligence and deficiencies are sufficiently incomprehensible; but they exhibit a fact of great importance, of which a hint was given in the conclusion of the description of the Mona Monkey. In the Talapoin, the last lower grinder differs from that of all Monkeys by the absence of an important part of its usual structure, and in the Mona the great air sac, which is in communication with the windpipe in most other Monkeys, is absent. This fact may be stated as follows:—That in animals closely resembling others of their group or genus material deficiencies in construction suddenly appear. Corresponding to these deficiencies are the absence of all or a great part of tail in genera the majority of whose species have a tail, and the inference to be drawn is that, notwithstanding all the members or species of a genus are related by a common ancestry, the decendants of a well-marked stock may exhibit peculiarities of structure which are not produced by alterations in the habits or surroundings of the animals.

Such peculiar structures often relate to a remote ancestor, and it is remarkable that in the case of this Talapoin they give it a very faint resemblance to the American Monkeys.

Some naturalists separate the Talapoin from the genus, and classify it in one of its own under the title Myiopithecus.

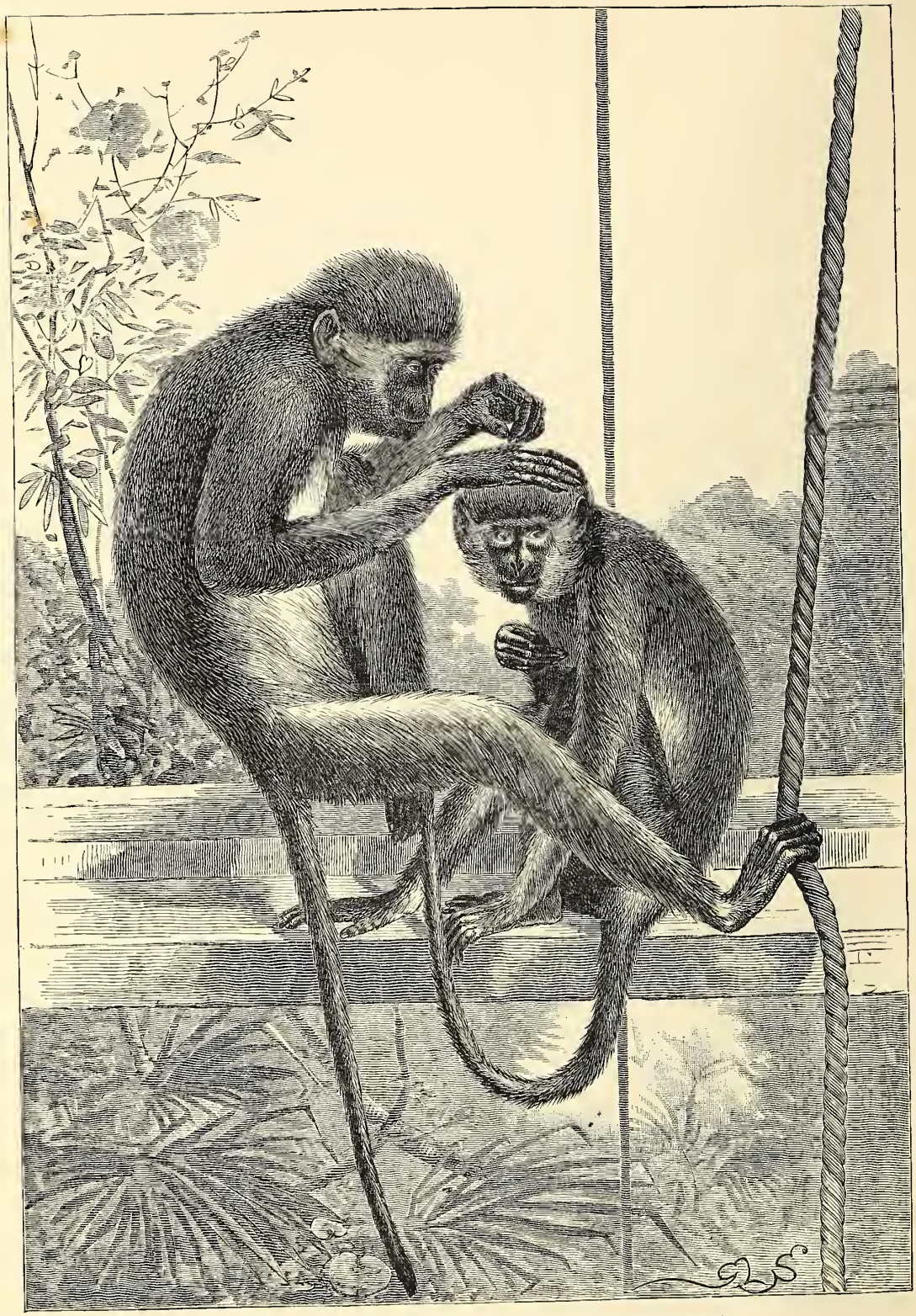
The third group of the Guenons is represented by the well-known Monkey called

THE GREEN MONKEY.†

It has its classical name from two words which mean beauty and hair (κάλλος and θριξ-τρίχος), and it must not be confounded with the Callitricha of Buffon, which is the same as the Grivet Monkey whose figure was drawn by the Egyptians.

The Green Monkeys live in Senegal, and extend as far south as the River Niger, for it was on the

* *Cercopithecus talapoin.* † *Cercopithecus Callitrichus.*



THE GREEN AND RED MONKEYS. (*From the Zoological Gardens.*)

borders of that river that Adanson, a French naturalist, noticed their collecting in great troops. The little Monkeys were astonished at his appearance, and as they rushed off into the forest they broke off, either purposely or by accident, little branches from the tops of the trees, whose falling relieved the stillness of the woods. He indulged in some very cruel sport at their expense, for although they had been so silent and noiseless in their gambols, he shot one or two without the others being frightened. But when the greater part were more or less wounded, they began to get under cover from the shot, some to swing behind large branches, some coming to the ground, and the majority jumping from the top of one tree to another. Whilst this little scene (*petite manége*) was going on, this scientific brute still continued to fire on them, and finally he killed twenty-three in less than half an hour. This he did in the space of some twenty toises, and yet not one screamed, although they often assembled together, knitting their brows and grinding their teeth, as if they intended to attack him. Broderip, in noticing this, writes, "I wish they had, with all my heart."

They have in common with the other Guenons a fondness for particular parts of their forests, and one band will prevent another from entering its favourite haunts; and this regard for companionship and locality is even seen when they are in captivity. Restless, irritable, and irascible they are ever at play, and fighting among themselves, but they will turn to expel a stranger.

It is said that this Monkey has obtained an American home, and that it was introduced with slaves into the Island of St. Kitts. Many escaped into the woods, and have increased considerably in number, so as often to pillage the plantations.

We introduce a kind here whose elegance of colour is great, principally to give a good notion of the general aspects of the Guenons, when not on all-fours, and also of the furtive look in the eyes of tamed kinds.

THE RED-BELLIED MONKEY.*

When living at the Zoological Gardens, in the Regent's Park, this pretty Monkey, with a red chest and belly, and slim tail, was very timid, but it liked to be petted by the keeper, being somewhat distrustful of its more romping companions. It would take food out of his hand, and seemed pleased, and generally played with his fingers, without attempting to bite. The canine teeth were very moderately grown.

This Monkey inhabits western Africa, and is at once known by the red belly and chest, the white beard and whiskers, and the black band across the forehead. It has, moreover, a yellow crown.

THE RED, OR PATAS MONKEY.†

The delicate red ground-colour of this Monkey readily distinguishes it from its more favoured allies. One in the Zoological Gardens is wonderfully human in the expression of its face and beautiful sad-looking large eyes. Its pale lips, eyelids, and cheeks, and the broadish pale forehead, with a slightly ridged nose, add to its appearance of suffering. It has a moustache, a few hairs on its nose, and whiskers, which are very cleanly kept in the proper whisker-line. The hair of the forehead forms a counter-curve, whose peak is just in the centre. Altogether it is a very pretty animal.

Bruce, the African traveller, when in Western Africa, took that trouble which is very rarely done by distinguished travellers in Africa, and observed Monkeys in a state of nature—the Red Monkey in particular. It is strange, considering the omnipresence of the Monkey element, that one may look over volume after volume of African travels, and very rarely meet with a note or word about them; but such is the case. So our obligation to Bruce is great. He says they descended in troops from the tops of the trees to the extremities of the branches, earnestly noticing, and apparently much amused by, the boats, as they passed along the river. They then began to take courage, and pelt the passengers with pieces of wood, thus provoking a most unequal combat. When fired upon, they uttered the most frightful cries, and although many fell, the survivors seemed by no means willing to relinquish the contest; on the contrary, they redoubled their efforts. Some flung stones at their adversaries, while others collected something very nasty as a missile; all, in short, displayed a determination of spirit which must at all times render them formidable to opponents of weaker powers than themselves.

* *Cercopithecus erythrogaster.* † *Cercopithecus ruber.*

The last group of the Guenons are often called the Mangabeys, from a mistaken notion that they come from Madagascar. But there are no Monkeys in that great island, whose forests are peopled by Lemurs instead.

THE RED-BELLIED MONKEY. (From the *Proceedings of the Zoological Society.*)

THE MANGABEY, OR WHITE-EYELID MONKEY.*

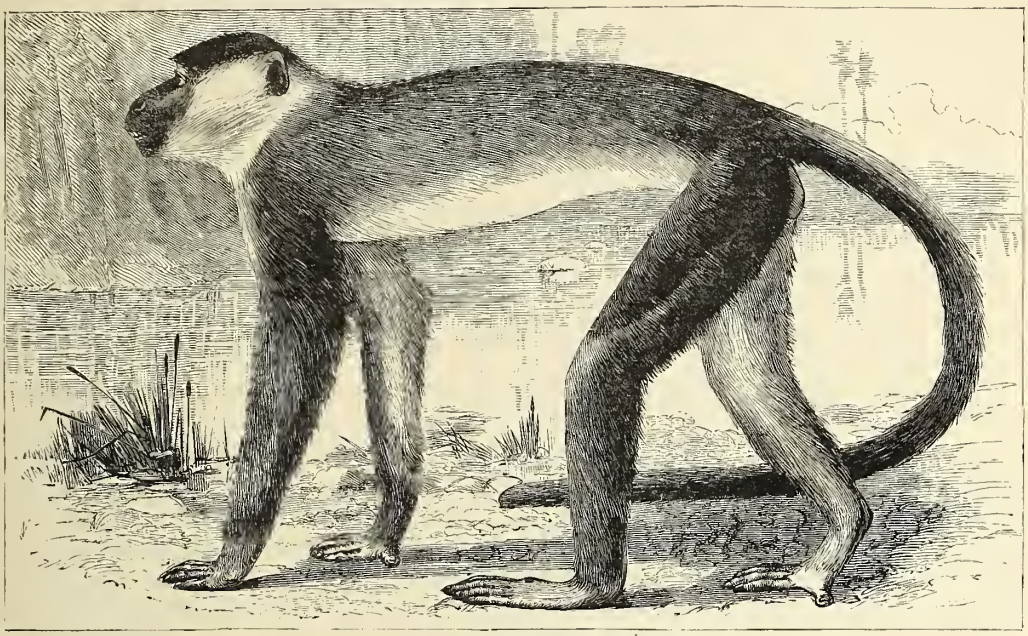
The general colour of this Monkey is a reddish-brown, which becomes decidedly red on the top of the head. There is a white band between the eyes, which is continued to each side of the back of the neck. A second kind has grey slaty-brown tints, without the white spot.

One thing strikes the observer at once, and that is the very affected way in which the Monkey sits, with its eyelids half closed; and as the upper ones are dead-white, they look almost like doll's eyelids, and as if they did not belong to it.

They are extremely restless, and are fond of placing themselves in curious attitudes, and so full of antics are they that it has been erroneously imagined that they really have more joints and

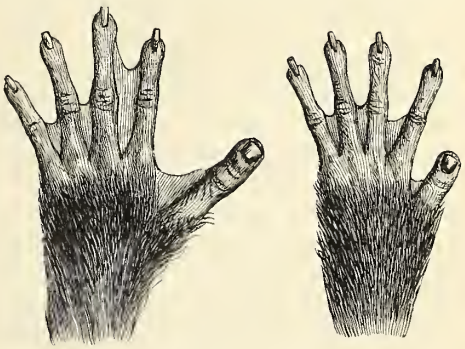
* *Cercopithecus Æthiops.*

muscles than the most agile of their allies. They are fond of carrying their tails reversed, so as to be on a line parallel with the top of the back, and their common expression of disgust is to show their teeth by raising the upper lip. It is always droll, frolicsome, and good-natured. Sir William Jardine



THE MANGABEY.

mentions a female in Mr. Wombwell's Menagerie that was most lively, and Broderip says:—"She performed many of the attitudes of the most experienced harlequins, and was remarkably cleanly and careful not to soil her person. When feeding, she seldom put her head to the food or dish, but lifted and conveyed it to her mouth. She was very fond of bread, milk, and vegetables, and of carrots especially." He gives a figure of her—no easy task, for she was never at rest for one moment, and her celerity was increased when she perceived she was noticed.



THE FOOT AND HAND OF THE MANGABEY.

The Mangabeys are all African, and are peculiarised by having a fifth cusp, or point, to the last crushing tooth on either side of the lower jaw, as in Semnopithecus. Now, they have no other resemblance to Semnopithecus, and all their structural peculiarities are those of the Guenons. They have, however, the web between the fingers carried as far forward as the first joint, and the hair comes close to the knuckles and the beginning of the short thumb. In the foot the toe-thumb is large, and, as usual, widely separate from the toes, the second and third of which are united by a web, which reaches almost to the last joint near the tips, and the third, fourth, and fifth are united by smaller webs. Evidently the peculiar crushing teeth of the Mangabey are a relic of an ancestral character, and we must look in some lower tribes for a corresponding arrangement, and in this we are assisted by the nature of the face, for the muzzle is rather projecting. In fact, they somewhat resemble the Macaques, or Inui, which will be considered next.

It is extremely interesting to find in Africa, and in the same parts of it, Monkeys living in the same forests, on the same kind of food, and exposed to the same climate and dangers, differing so

wonderfully in their colour and disposition. The difference has been caused by something more than adaptation to ends. Again, it is curious to note the different arrangements of the dental structure in the group amongst animals eating the same food and stowing it away in pouches.*

CHAPTER VII.

THE DOG-SHAPED MONKEYS (*continued*)—4. THE MACAQUES.†

Their Description and Anatomy, and its reference to that of the Semnopitheci and Guenons—THE COMMON MACAQUE—Its Character—Appropriateness of the Name—Occasionally an Albino—THE ROUND-FACED MACAQUE—Found in China—Ideas of the Chinese about them—THE TOQUE, OR BONNET MONKEY—THE BHUNDER—Described by Cuvier—Their Thieving Propensities—Hindoo Tales of their Sagacity—THE MOOR MONKEY—BELANGER'S MONKEY—THE PIG-TAILED MACAQUE—THE MAGOT—One of the Commonest Monkeys—Described by Galen—Early Notices of—Predatory Habits—Abundant at Gibraltar—Probably come over from Africa—Similarity to the Baboons—THE WANDEROO—Account of one in the Zoological Society's Collection—Geographical range of the Macaques.

THE next group of Monkeys differs much from the lively dwellers amongst the woods and trees, which have been described, and the kinds contained in it are evidently suited for running quickly on all-fours, and more on the ground than amongst the branches. They are not so much like the Dog in shape as are the Baboons, which will be described next, but still they are, as it were, between these and the Guenons in their habits and construction. They have longer muzzles than the Guenons, but not so long as the Baboons, and the nostrils open high up and obliquely. Their eyes are overshadowed by a prominent brow-ridge, which gives an air of cunning not seen in the playful Guenons, and also a look of fierceness and of mistrust; and, in fact, the old ones look anything but amiable. Their limbs are stout and compactly made, and they display great strength and width in the shoulders. The hind limbs are, however, longer than the front ones, and the hands and feet are well made, the latter being long and having a large heel. But what strikes the observer, when he sees drawings or stuffed specimens of the whole group before him, is the difference in the length of the tail in different species. Some have long tails, others have very small ones, and one in particular has not one at all. Those with tails used to be placed in one genus, and those without them in another; and the first were called Macaques (*Macacus*), the others being Inui‡ (*Inuus*). But the close agreement of the other parts of the body, notwithstanding the length or absence of the tail, coupled with the fact that it is not used in climbing or in balancing, determined naturalists to rely but little upon that member in this group, and to join those with tails and without tails in one genus, called *Macacus*.

Those with long tails, the *Macacus Cynomolgus*, for instance, cause the group to resemble the Guenons; or, in other words, link and ally the two genera, it being difficult in the case of this Monkey to say to which one it should belong. On the other hand, the Barbary Ape, which managed to get to Gibraltar and live there in some numbers, and which has but the very stump of a tail, connects the whole group, or genus, with the Baboons without tails. Then there is one with a fine head of hair, and a long snout (*Macacus Silenus*), which lives in Malabar, and which has a longish tufted tail; and it links some Baboons with long tails to the group now being described.

The Macaques live in India, Thibet, North and South China, Japan, and southwards, and in some of the great islands of the Archipelago, Formosa, in Africa, in Barbary, but not south of the Atlas range, and in Europe, on the Rock of Gibraltar.

They all have cheek-pouches and callous pads, or callosities, on their seat, and thus resemble the

* In the Cercopitheci the skull has a large brain case, and that part on which the brain and cerebellum rest is concave or pitted on the petrosal bone, and on either side of the crista galli in the fore part of the skull. In general there is a laryngeal pouch. The first premolar is like that of the Semnopitheci. The other anatomical peculiarities of these and of the Semnopitheci will be found in the description of the Macaques and Baboons.

† *Macacus*, or *Inuus*.

‡ A name of the Roman divinity Faunus.

Guenons; moreover, most of them have throat or laryngeal sacs, which open into the membrane above the vocal organ and below the base of the tongue (in the thyroid membrane).

On examining their jaws it will be noticed that there is the same number of teeth as in the other Monkeys already described, and that the upper eye or canine tooth on each side is very strong and long. Now, these teeth are not for killing or stopping living prey, although their possessors do not hesitate to snap up a good-sized Beetle, a small Lizard, or even a Frog, but they make, with the first false grinder of the lower jaw, a capital nut-opener. The canine, when the mouth is shut, fits just in front of this tooth, which is usually called the first pre-molar, and which is pressed back and made to slant in the jaw by the constant pressure and movements of the canine. The back of the canine is sharp, and comes in contact with the equally sharp edge of the slanted pre-molar below, so that when a nut comes between the two it is cut and crushed at the same time. The canine does not thus fit into a diastema, or vacant space, but is of great use to the animal. This arrangement is interesting, because it produces a distortion of the front back teeth of the lower jaw for a definite and useful purpose: it is noticed in some of the Guenons, and is particularly seen in mouths of the great Baboons, which will be noticed further on.

The other back teeth resemble somewhat those of the Guenons, but the last one of the lower jaw has five cusps, or prominences, on it.

All these Monkeys going very readily on all-fours have several interesting modifications of the structures observed in the climbing Monkeys, but of course their general construction is the same. They have not, however, the pouched stomachs of the Semnopithecus, and their nearest resemblance is with the African Guenons.

Like in all the Monkeys which are lower in the animal scale than the great man-shaped Apes, the Macaques have narrow wrists, long finger-bones, and a short and backwardly-placed thumb. There are nine bones in the wrist. The hip and haunch-bones are long, and the first are hollowed out, and their direction refers to the method of progression on all-fours, and their general appearance is rather that noticed in the regular four-footed beast of prey, and they differ much in breadth relatively to those of man.

The length of the tail depends upon the number of the tail-pieces, or vertebræ, and upon their size. In the Gibraltar Ape there are only three of these caudal vertebræ, but in the Bhunder there are fifteen and sometimes eighteen in the tail, which measures nine inches, whilst in the Pig-tailed Inuus there are seventeen. It appears that some of the long-tailed kinds have no more vertebræ than the others, but that the diminished length is due to their shortening. The long and middle-sized tailed kinds have chevron or Y-shaped bones under the tail, and the nature of these has been explained already.

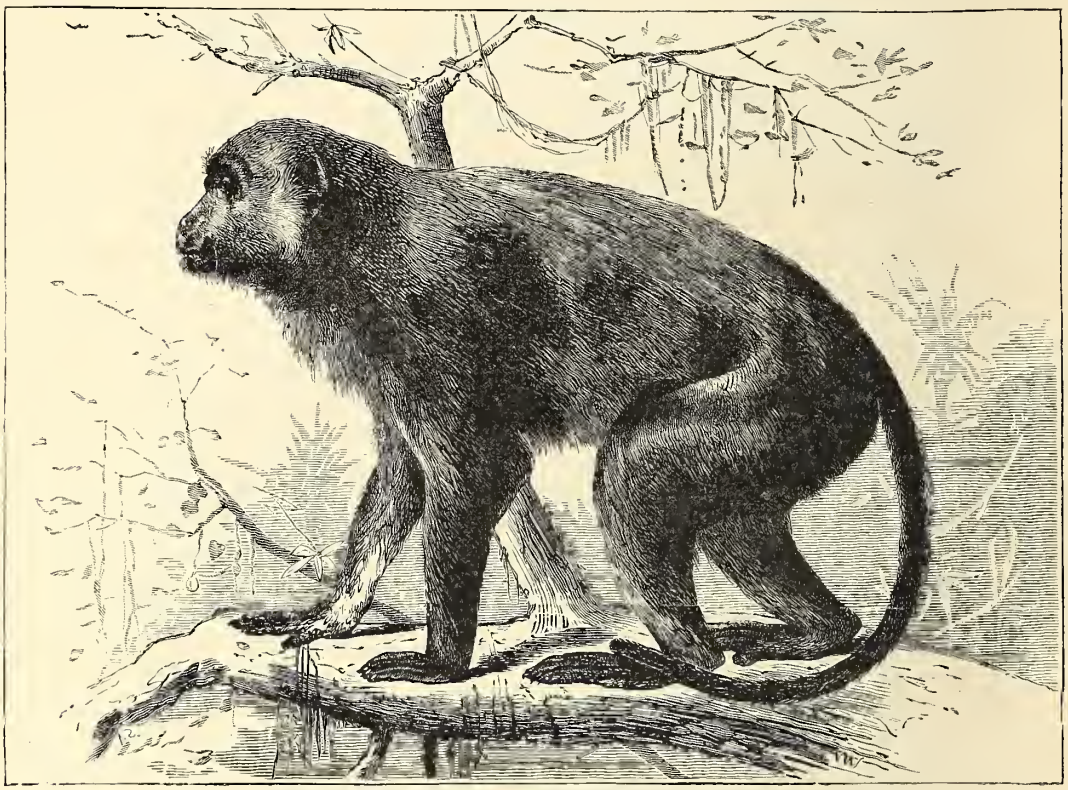
Living upon a great variety of food, and using their jaws with rapidity, these Monkeys are furnished with a curious modification of a muscle, which exists in man and the higher Apes. There is in these a muscle on either side of the throat, which draws the chin down, or, in other words, helps to open the mouth. It is called the two-bellied, or digastricus muscle, as it has two muscular masses—one attached to the lower jaw, and the other to the lump of bone behind the ear—and they are united by a thin tendon. This tendon is attached to the side of the bone at the base of the tongue, or os hyoides, and it passes through a loop of a muscle which passes from the ear-bone (*styloid process*) to the os hyoides. The muscle acts as follows:—When the mouth is to be opened after swallowing, the base of the tongue-bone is pulled down by a muscle which comes from the breast-bone to it, and then the front belly, or muscle of the digastricus, pulls from the base of the tongue against the lower jaw and drags it open. But when the muscle relaxes, and the jaw is shut preparatory to swallowing, the digastricus begins to assist in this operation. In swallowing, the base of the tongue is drawn upwards towards the roof of the mouth, and the back and front bellies of the muscle now under consideration drag on their fixed tendon, and straighten, so as to assist in this.

In the Macaques, this tendon is replaced by muscular bands, and greater vigour is given to the muscle, so that the jaw is pulled at more rapidly, and the tongue is elevated with energy.

As there is a greater power given in drawing up the tongue in the first stage of swallowing, there must be something extra to pull it down again in the second stage, for in this the back of the throat, the gullet, and the back of the tongue are all brought from above to a lower level. This is arranged

by a modification of a muscle, which in man and the Chimpanzee, for instance, stretches from the top of the bladebone, across the lower part of the neck, to the bone at the base of the tongue (the *omo-hyoid* muscle). It has also two bellies in man, or, in other words, the muscular fibres are attached to the bladebone and to the hyoid-bone, and there is an intermediate tendon ; moreover, this passes through a pulley, so that the obliquely-placed muscle in the lower part of the neck acts straight upon the tongue, and pulls it down in a right line. In the Macaques, this muscle has no central tendon, and the muscular fibres pass all the distance from the bladebone to the os hyoides at the base of the tongue.

In addition to these modifications where muscle replaces tendon, there are those of several other muscles which act on the tongue, the larynx, and on the upper and lower parts of the windpipe, their



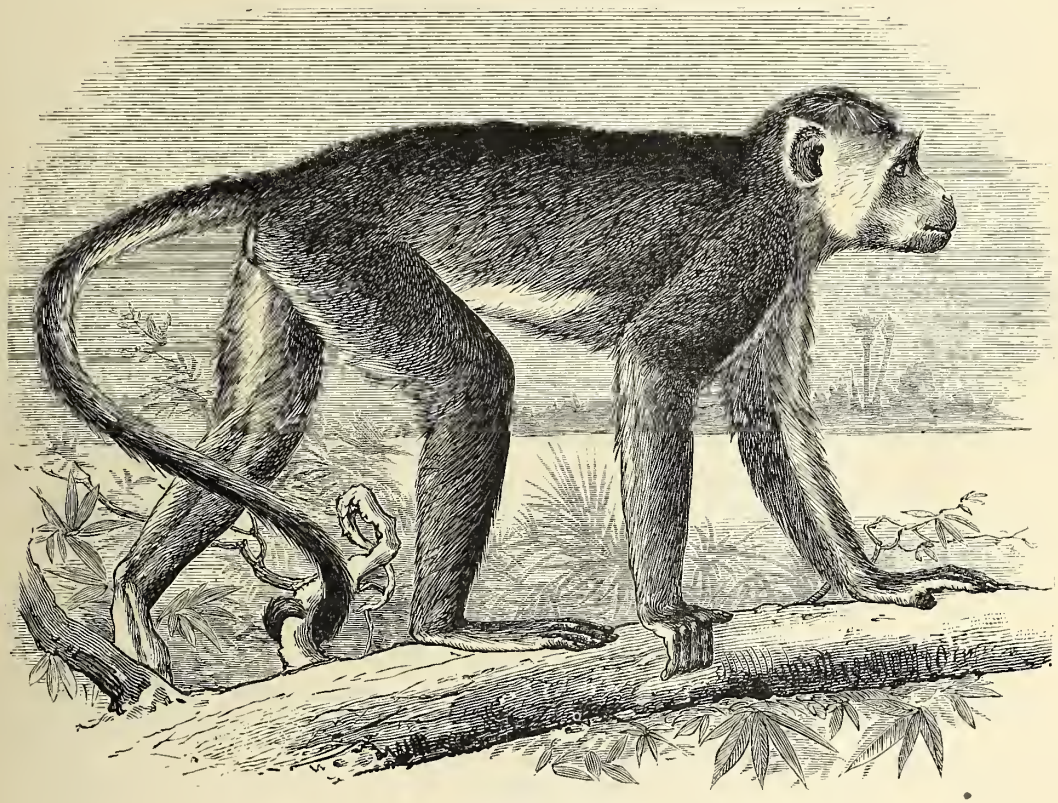
THE COMMON MACAQUE.

conjoined action being to approximate all these parts. These muscles, which are separate in man, are united in one in the Macaques.

The head of these Monkeys, hanging as it does when they go on all-fours, requires extra support, and one of the muscles of the back, which from its square shape is called the rhomb-shaped muscle, is especially attached to the occiput, and helps to hold the head up. Another assistant in the movement on all-fours is a muscle which pulls the bladebone forwards when the animal is walking. It springs from the outer processes of the upper bones of the neck (transverse process of the upper cervical vertebræ), and is attached to the spine of the bladebone. This muscle is seen in the great beasts of prey also, and in the Semnopitheci and Guenons. A similar "wild-beast" peculiarity exists in the arrangement of the muscles of the hand; the muscle which extends the little finger and opens it is divided, and has greater connections with the fourth finger than in man. The long muscle which extends the thumb, and the short one which draws it from the fingers, are not separate in the Macaques, but the muscle has two tendons, and thus foreshadows the arrangement which in man and the higher Apes gives such perfection of movement to the thumb.

The Macaques have their ears rather pointed at the tip, and not rounded, and the general shape of their bodies is not lanky like that of the active long-legged Guenons and Semnopitheci. They are less gracefully made, and the dog-like appearance, so palpable in the Baboon, is recognised in their fore parts and head. Moreover, the colours are not usually pretty and variegated, as in many of the kinds of the genera already described, but are dun and sad in tint. Their tail varies according to the species in length, and a rough method of classification may be made which divides them into those with long, those with moderate, and those with short and almost no tails.

The large Common Macaque (*M. Cynomolgus*), and the Round-faced, or Formosan Monkeys (*M. cyclopis*), and the Bonnet Monkey, represent the long-tailed kinds; the Bhunder (*M. Rhesus*), has a tail of middle length; and the short-tailed group about to be mentioned consists of the Moor,



THE TOQUE.

the Pig-tailed, and the Belanger Monkey. The tail-less one includes the Magot. Finally, the Silenus Ape, usually miscalled Wanderoo, is so baboonish that, although it has a long tail, it cannot be placed with the Common Macaque in the beginning of the chapter, but must come at the end, so as to lead to the true Dog-headed Apes, or Baboons, which will be described further on.

If the remarks in page 106 about the fourth division of the Cercopitheci are now read carefully, it will be understood how these Monkeys, the Macaques and the Baboons, form a group of creatures which is only really separable into kinds or species, but that the genera are very artificial.

THE COMMON MACAQUE.*

The so-called Common Macaque, or *Macacus cynomolgus*, represents the long-tailed section of the genus, and grows to be a powerful animal amongst the other small Monkeys, over a very wide extent of country. It lives in Java, Sumatra, Borneo, Celebes, Batchian, in the islands from Lumbok to

* *Macacus Cynomolgus.*

Timor, and in the Philippines. It is a quiet and tolerably amiable Monkey when young, but with years, it becomes a wild, savage, and very brutal creature. Even in menageries it is often nasty in its habits, and savage. So bad a character has it, that when the proper name to give it came under the criticism of Fred. Cuvier, he sought out those of all the wickedest and naughtiest men in Lempriere's Classical Dictionary, and finally considering that *Irus*, who disturbed the domestic peace of the sublimely virtuous, industrious, and persevering Penelope, was the worst of the worst, he fixed his name to that of this Monkey. But Buffon had, not from his bad qualities, or from any resemblance to the Monkey in disposition, his name attached to it long before; so it was called Buffon's Monkey, as well as the Hare-lipped, although one fails to recognise this condition in its face. To complicate matters, an English zoologist, who knew little of Penelope's feelings or trials, mistook the word Irus, and wrote it Iris! The word Cynomolgus may be translated "a pilfering or a lewd dog," so that it and Irus are very appropriate.

The huge shoulders of the full-grown adult strike one, and its general clumsiness also. There is a large body, and the limbs are short for it, although the tail is long. The fur is rather short, and is of an olive-brown, spotted with black on the head and body, but it is grey on the limbs, and blackish on the tail. There is no "hare-lip" in this Monkey, but there is no hollow going from the nose to the upper lip as in man, and only a raised line.

This Monkey is sometimes found perfectly white, with red eyes, or as an albino; its skin is then of a pinkish colour, and the long tail looks very curious, as there is not much hair on it. A male and female of this kind are very interesting in the Zoological Gardens; they dislike the glare of day, and are very lively and full of fun and malice. The female has the whiskers and all the beauty of hair, and the male is a quieter animal, but a great grimace-maker. He tries to look fierce when the sun is on his face, and looks most odd. He draws back his ears, so that they cling to the back of his head, and wobbles his eyes about in a most laughable manner. The female does not like to be disturbed in her nap after breakfast, and comes out to see what is the matter. If anything noisy is going by, she scolds violently, and if she can catch hold of her drinking-tin, she will bang it about in a very amusing manner. Sitting in her wooden house, she bangs the outside with the tin, and then dropping it, rushes out and fixes her teeth on the wooden branches in the cage. The deficiency of colouring matter in the iris of the eye allows so much light to enter that organ, that there is the same scowling or shading eye look in them as there is in human albinos.

The second example of a long-tailed genus is

THE ROUND-FACED MACAQUE,* THE FORMOSAN MONKEY.

These are very interesting Monkeys, with a human-like expression, which suffer considerably at the hands of the Chinese, for should one be captured, its tail is immediately cut off, the Chinese having a fanciful idea that the tail of the Monkey is a caricature of the Tartar pendant into which they twist their long back hair. They therefore cut off the tail of every Macaque that comes into their possession.

They live in Formosa about the declivities and caverns which overhang the sea, miles away from any woods. It seems to be quite a rock-loving animal, seeking the shelter of the caves during the greater part of the day, and assembling in parties in the twilight and feeding on berries, the tender shoots of plants and grasshoppers, &c. In the summer it collects in bands during the night, and commits depredations among the fields of sugar-cane and fruit-trees. They nurse their solitary young ones up in the hills, and betray much uneasiness—no wonder—at the approach of man. They seem, however, to possess abundance of self conceit.

The Chinese have some very curious notions about them, and about some other Monkeys which are either identical or are found with them. They say that in the Yaoukwang hills are animals whose exterior appearance is like a Mehow with human face and Hogs' bristles. During the summer they dwell in caves. They are called Hwatso, their cry is like cut water (noise of a mill), and when seen they are "ominous of a conscription" (*i.e.*, of being forced to work). The Yew are like the Mehow and of a deep black colour; their tails are long like the others, but have no tufts. When

* *Macacus cyclopis.*

they scent the dew ascending to form rain, they then suspend themselves by means of their tails to fill their nostrils with it, or else by both feet. The Gaou are said to inhabit the Lunseen hills, to be like an Ape with long arms, and to be good for killing. When their arms are cut through at the thick part, they can be made into flutes rounder than reeds. They are of the Monkey tribe, having long legs, and are good whistlers, and given to drag things about. The Yew are like the common Monkey, with green body and dark paws; they have black whiskers and black paws. They are naturally very fond of their whiskers, and doat on their species, living and dying together; on which account, if one can be got at, a hundred will be killed. Men shoot them with poisoned arrows; the shot animal's companions draw out the arrow in order to wound themselves and die with one another.

These round-faced Monkeys have, of course, callosities on the buttocks, and these at certain times become gorged with blood, so as to swell out and become greatly distended, being horrible to look at.

They resemble the common Rhesus Monkey, about to be described, in many points, and indeed the skulls present so many things in common that no satisfactory distinction can be made; but the bones of the pelvis, which are much curved, and the shorter limb-bones of the round-faced species, are distinctive.

The fur of this Monkey is thick and woolly, and is very slate-coloured. The tail is about a foot in length, is hairy, and has a black line along the top. The head is round, the ears are small and feathered, and the face is flat. The forehead is naked and the cheeks are dark-whiskered, and there is a strong ruffle-like beard.

THE BONNET MONKEY.*

This is a very common Monkey in menageries and zoological gardens, and is always an object of attention, as it is amusing, very active, full of tricks and malice, and a great stower away of nuts in its cheek-pouches. It is known amongst the other Macaques by its cap of long hair radiating from the crown, on which it rests flat, but it is often parted down the middle. It has a long tail, rather a long muzzle, and prominent ridges over the eyes, and the forehead is flat. Its fur is olive-grey, and sometimes greenish or brown in tint, whilst the under surface is ashy-white. It has large and often flesh-coloured ears.

The young often have their head of hair parted down the middle, and, as their face and forehead are pale and not hairy, they have a very human appearance.

Very good-tempered when pleased, this Macaque enjoys a bit of mischief, and if it can steal anything from a visitor it is intensely delighted. But when food is offered and then not given, the Bonnet Monkey shows that it considers itself wronged, and scolds and screams in a great rage. It has a great capacity for accepting and stowing away food, and there are often great fights if one intrudes upon the store of another. Very fond of hugging and nursing others, it is equally delighted in searching the bodies of its companions for insect life; but, although thus amiable, it resents unkindness very decidedly and at once.

Another common Macaque is called the Toque, but it only differs from the Bonnet in the parting of its hair.

THE BHUNDER, OR RHESUS MONKEY.†

This is a Monkey with a medium-sized tail, which is well known to those Europeans who have lived in out-of-the-way places in British India.

It is a strong-looking creature when full grown, and has powerful shoulders and limbs; the tail is about one-third of the length of the body, which often attains the length of from one foot and a-half to two feet. The prevailing colour of the hair is olive-green and brown on the back, and the naked face is of a pale flesh-colour. There is no ruff of hair around the neck, and the ears are very visible, and there is a singular looseness or folding of the skin of the throat and belly. The callosities are often very red, and the insides of the legs also.

F. Cuvier observed the early days of one born in France, and noticed that immediately after birth it clung fast to its mother's stomach, holding on with its fore hands stuck in her fur, and that it did not quit the breast, even during its sleep, for fifteen days. In the first day of its existence it appeared to distinguish things, and to look at them carefully, and the mother was devoted to it, giving it the

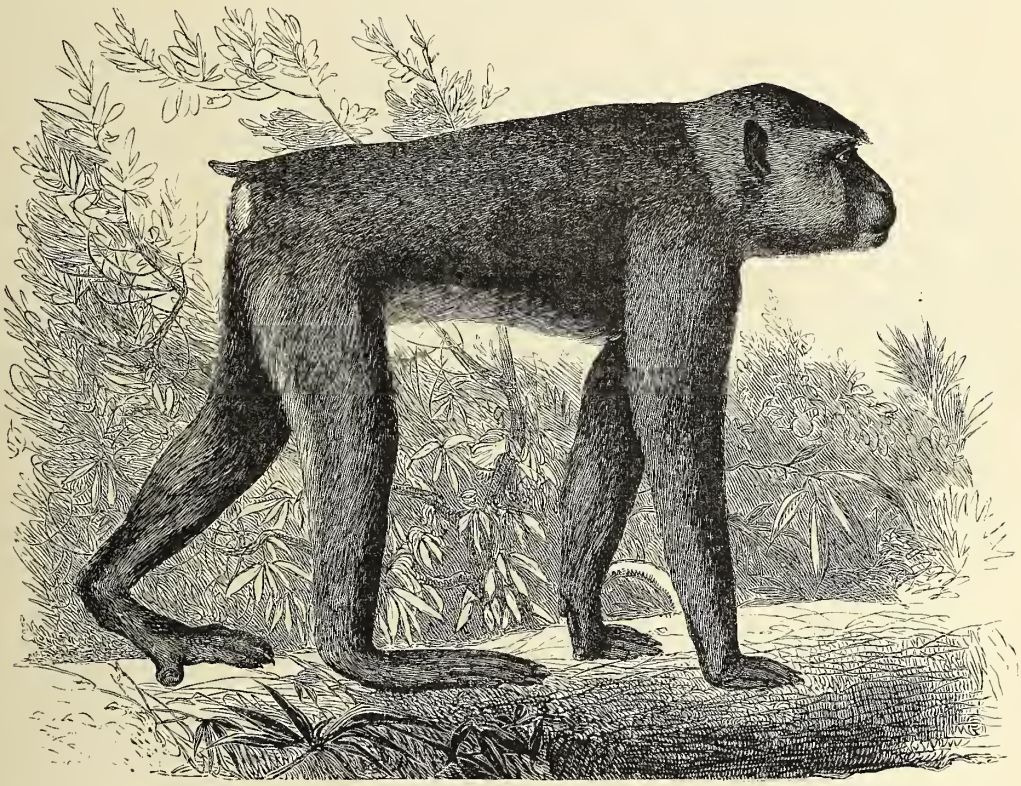
* *Macacus radiatus.* † *Macacus rhesus.*

tenderest attention of a constant and patient nurse. Not a movement or noise on its part escaped her, and her maternal solicitude was quite astonishing. The weight of the little thing did not interfere with her moving about, and all her exertions were managed with a view of not incommoding her young charge. She never shook it, or struck it accidentally against the edges and corners of her house. At the end of a fortnight the little one began to detach itself, and from the beginning of its moving by itself it showed a great amount of vigour, power, and ability to run and jump, which human children of a year or two might well envy. It held on to the wires of its cage and crawled up and down at

THE BHUNDER, AND A BONNET MONKEY.

will, but the careful mother never took her eyes off it, and followed it wherever it went, and even held out her hands to prevent it tumbling when it became too venturesome. Indeed, she admonished the little one by a gentle touch that it had been away long enough, and must come in. At other times it walked on all-fours over the straw, and often let itself drop down from the top of its cage on to the soft bottom, so as to accustom itself to fall on all-fours ; then it would jump up the net-work and lay hold and scramble with great precision. After a while, the mother began to teach the young one not to be so troublesome to her, and to manage without her, but still she took care of it, following it if it was doing anything out of the way and in danger. With strength the agility of the creature increased, and its jumps and bounds were wonderful, and it never miscalculated its distance, or made a false step. After six weeks a more substantial nourishment than milk was required, and then a very curious

spectacle was seen. This attentive mother would not let the little one have a bit of all the nice things, but drove it away and scolded it, although it was hungry. The old one took possession of the fruit and bread which were for both, and boxed the little one's ears if it came close and hid up the food. She had hardly any more milk, and the young one was in daily want of food, but the old one did not appear to act from cruelty or gluttony, but wished to train up the youth, like the young Cyrus, to feats of daring and of skill. As hunger pressed, the young one became bold, and stole by art what he could not get otherwise. If he was very adroit, all the better, and he was commended by being allowed to carry off his own. He used to get to the further end of the cage, and turning his back on his mother would begin to gormandise. But even the maternal solicitude was not wanting, for she



THE MOOR MACAQUE.

often used to go up to him and snatch a nice titbit out of his jaws. Perhaps this was a mistaken idea, for after a while a larger quantity of food was placed in the cage, and the little one had its quantity without any stealing.

The Bhunders are sacred in some parts of India, and are left very much to themselves; so they assemble in troops, and steal from among the natives in a very troublesome manner.

As they are very bold, their habits in the wild state are often observable, their slyness and thieving propensities being most amusing. They gather on the roofs of the low houses in the bazaars, and look out for occasion to steal. One was observed on a roof fronting a sweetmeat shop, and feigning to be asleep; but every now and then he looked wistfully at the luscious prizes below. It was, however, of no use, for sitting beside his stores was the seller, smoking his pipe, and looking decidedly wide awake. This went on for half an hour, when the Monkey got up, yawned, and stretched himself artfully, as if he had only just awoke. He began to play with his tail, and even made believe he was tying knots in it, as if he were wholly intent on it; but ever and anon he gave a sharp, sly look over his shoulder at the sweetmeats, but only to see the seller still there

smoking away to his heart's content, and ruminating concerning prospective customers and profits. The Monkey still had patience, and amused himself with his fleas, and had a good and general scratch; and he was rewarded, for suddenly the confectioner arose from his seat, took his pipe, and turned towards the back door for a fresh supply of tobacco. Instantly the Bhunder was on all-fours, and the sweetmeats were before him and behind their owner. In another moment he had jumped off the roof, cleared the street, and was on the board which was crowded with sugar-plums. He of course began to cram as many as possible into his cheek-pouches. But, alas for the spoiler, there were other pilferers there in the shape of hornets; his sudden descent frightened them, and they flew off, but returned on the instant, and to take vengeance. Before he could regain his roof they were all round him, stinging here and stinging there with great zeal and passion. His efforts at getting away from them were frantic, and he scrambled over the rotten roof, displacing the tiles, which came down with a crash; and at last, when he jumped clear of the enraged insects, he came on to a sharp, thorny bush, from which he could not extricate himself. He had to spit all the nice things out of his pouches, and, screaming with pain—for the thorns were more like fish-hooks than anything else—he sat a picture of misery, barking hoarsely now and then. The fall of the tiles brought out a crowd of natives, and they were speedily joined by the confectioner, full of revenge. But the culprit was a Monkey, and, therefore, an object of veneration; so a couple of Hindoos managed to rescue him, and he limped off as well as he could to a neighbouring grove.

The Hindoos tell many tales of the sagacity of this Monkey; and there is one which may be taken as a specimen, although it has been filtered through Mahomedan pages. A fakir had a Monkey which he had brought up from birth. He loved it, and travelled here and there, taking much care of it. In return the Monkey behaved like a watch-dog, and was most faithful and watchful. It amused the fakir by its endless tricks and mimicry. One day, the fakir placed his carpet in a square before the palace of some great shah who had nothing to do, and who looked at the fakir and the Monkey with great delight. The fakir had made a pie; there were some pieces of birds' flesh in it, and it was placed on some lighted charcoal to be cooked. The Monkey sat watching, and the fakir thought he would like a stroll until dinner was ready, knowing that his faithful follower would look after the cooking. But the shah saw more than the fakir; for, after a while, the smell of the meat came strongly into the Monkey's nostrils, and he began to feel hungry. Soon he was very hungry, and then he just lifted up the edge of the crust, and could not refrain from taking a tiny bit—just a little leg. This was so nice that he took a little more, and finally eat all. The crust was left on the grass, and then the sinner suddenly remembered his master. The shah was in ecstasies, wondering what would come next. After due consideration, the Monkey remembered that he usually sat on a very beautiful flesh-coloured "callosity," and he had noticed that several Crows and other birds had been hovering about whilst he consumed his master's dinner. He instantly feigned to be dead, and hiding his head, gave the birds the benefit of the scarlet appearance. One came down instantly with a swoop; but the Monkey was too quick, and the bird was seized and strangled in an instant. Rapidly plucking off the feathers, the Monkey pulled it to pieces, and put it in the pie, and sat looking happy, contented, and extremely virtuous. The shah was struck with this wonderful display of instinct, and the story goes on to say that he promoted the fakir to an important post under government.

There is a Macaque which, instead of having the quiet brown and olive tints of the others, with short tails, is of a dark oily black colour. It is called

THE MOOR MONKEY.*

It lives in Borneo, and is about eighteen inches in length. It has a flat nose, with nostrils opening well outwards, and the eyes are hazel, the pupils being very large. The length of the bones of the tail is not enough to carry it beyond the callosities, which are of a roseate hue.

When young the skull is short, and there is no great projection over the eye; but with age the upper part of the face becomes very square, and the eyebrow ridges grow. Now, this gloomy-looking Monkey offers some points of interest, for there is another one, called the Booted Monkey (*Macacus ocreatus*), which cannot be distinguished from it when both are young. With age, however, the last-

* *Macacus Maurus.*

named one becomes oily black, has a longer tail, and the hair on the head has a bushier appearance. But can these distinctions be accepted as showing a difference in the species? Probably not; and it will be for the student to consider that Monkeys may have races and varieties which really pertain but to one species, and yet are separated by the naturalist.

There are other short-tailed species of the Macaques, of which one, called the Handsome Monkey (*Macacus speciosus*), has a red face. It is from Japan, and is educated by the showmen there to do tricks like the Rhesus Monkey of India.

Another kind is interesting, because it gives a hint how a tail may be gradually lost from being in the way.

BELANGER'S MONKEY.*

This is found in Cochin-China, Singapore, Burmah, and up in the hills of Upper Burmah, Cochin, and Assam.

Its tail is more than a stump, yet is not half a middle-sized one, as it does not come lower than the haunch-bones. The Monkey is much troubled with it. Sometimes it is stuck up erect, but usually it is curled inwards, as if the animal were ashamed of it, and had done something wrong. When this is the case, the end quarter of it is doubled up, and thus the space between the haunch-bones is filled, as it were. The animal then sits on its tail and on its callosities, which are on the haunch-bones, and the consequence is that the surface of the tail, thus compressed, becomes hard and callous. Here, writes Dr. Anderson, the Indian zoologist, is an instance of a Monkey sitting on its tail; and the habit appears to be peculiar to the species. The tail is very degenerated, so far as its bones are concerned, and the curvature of it appears to be caused by the animal desiring to curve it out of the way of pressure. Perhaps, according to Lord Monboddo, this is the first symptom of the loss of tail. With regard to the other peculiarities of this species, it may be mentioned that it has pretty eyes, and is exceedingly easily domesticated.

THE PIG-TAILED MACAQUE.†—THE BRUH.

This is a short, thin-tailed kind, comes from Sumatra, Borneo, and the Malay Peninsula, and is called by the natives the Bruh—climber of the palms. Is is said to be used by the natives to collect cocoa-nuts, and is domesticated by them, being often found in their houses.

THE MAGOT.‡ THE BARBARY APE. THE TAIL-LESS APE.

This is a very celebrated kind, and it has made its mark in the history of science and of the world. It was dissected by Galen; it took part in the great siege of Gibraltar, and is one of the most popular of the companions of the organ-grinder. Moreover, as will be noticed further on, it is an animal which may be classified with the *Cynocephali*, or true Baboons, to be described in the next chapter, without doing much violence to science.

It is called Magot by the French, and it is the Pithecus of that great old physician, Galen, who, when he could not learn anatomy by dissecting the human body, which was not allowed, investigated that of the Tail-less Ape. Born at Pergamo, about the year A.D. 131, Galen studied literature and then anatomy when young; and visiting Alexandria, was greatly delighted with being permitted to examine a human skeleton there, and subsequently to dissect a robber, who had remained without burial. Seeing that anatomy and physiology were the very foundations of medical practice, and noticing the resemblances of man and the Ape, he set to work and wrote largely on anatomy, but made the Ape his model. He was far before his age, and, therefore, abominable in the eyes of the antiquated practitioners; so his career as a physician in Rome was short. Nevertheless, his voluminous works lasted longer than his critics, and influenced the rise of medical science and the comfort and lives of mankind for many centuries. His anatomy was wrong, because it was that of the Ape and not of man; but, nevertheless, so strongly were the medical anatomists—who never dissected but only read—impressed with the correctness of his so-called human anatomy, that when Vesalius did dissect men and describe them,

* *Macacus brunneus.* † *Macacus nemestrinus.* ‡ *Macacus sylvanus, or Inuus caudatus.*

he was pooh-poohed by the faculty as of no authority whatever. Just as Oxford opposed the learning of Greek, so the first physician of Henry IV. of France decided against human anatomy and Vesalius; but Greek and Vesalius triumphed after a while.

Nevertheless, humanity for many centuries was under a deep obligation to the Magot, inasmuch as surgery, as applied to man, was founded upon observations on the construction of the Ape.

Strabo knew that North Africa was peopled by the Tail-less Ape, or Pithecus; and he asserts that Posidonius, on going from Cadiz to Italy by sea, stopped in Lybia (the present Barbary), and saw large numbers of these Apes in the forests, which came down close to the water side.

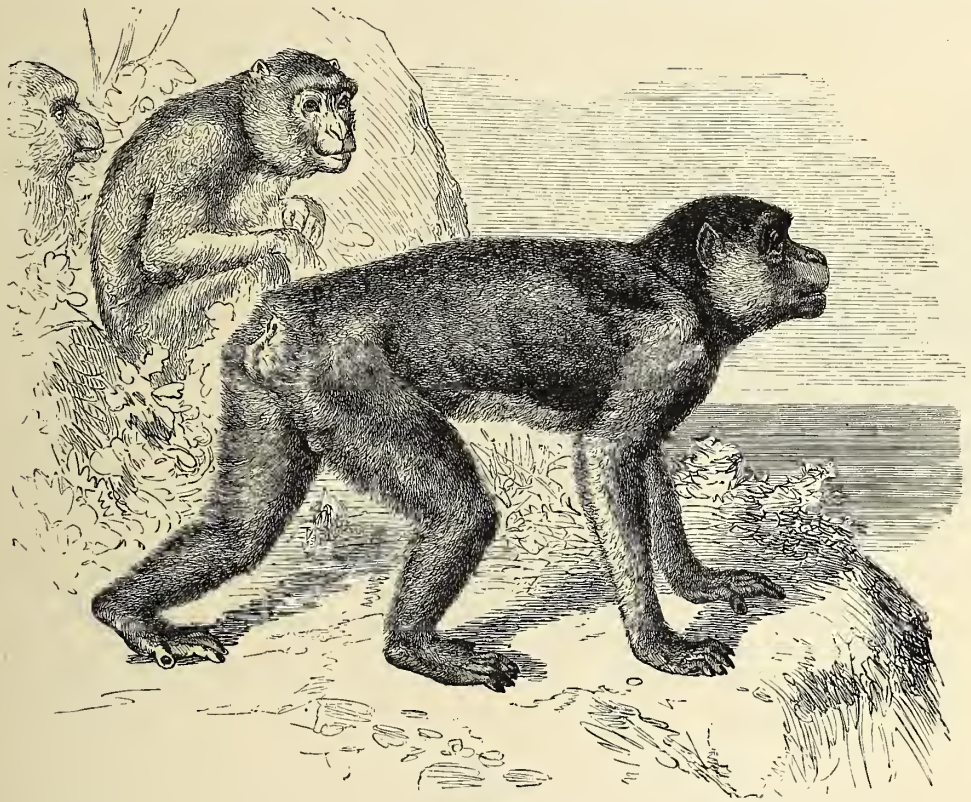
The Magot is about the size of a middle-sized Dog, and measures from two to two and a half feet

THE PIG-TAILED MACAQUE.

in length. The upper parts of the body and outsides of the limbs are of a light yellowish-brown colour, which is deeper on the head and round the cheeks; the under parts are whitish; and the face, ears, and other naked and hairless parts are flesh-coloured. The bald face, rather pale in tint, is long and wrinkled, and it is this which gives an old look to them, even when they are young. It is a robust animal when full grown, and has then deeply-set eyes, which are rather close together, and a projecting brow. The erect posture can be maintained for a short time, but it is not natural to it; on the contrary, it moves on all-fours quickly, jumps and climbs with great agility, scampering over broken ground or getting into the trees equally well. It squats on its haunches, and often sleeps with the head hanging down over the chest. Always alert and full of mischief, they assemble in troops, especially on the flanks of the Atlas range, place their scouts on trees, like so many Crows, and despoil the fruit plantations and gardens. In this they resemble the Baboons, whose marauding expeditions will be noticed further on.

This is the Monkey which is tolerably common on the Rock of Gibraltar; and they were there before the sea wore away the land and formed the Strait. They are essentially Rock Apes, and like

trees near rocks, and, therefore, they are not found in desert tracts or in deep woods. Formerly the Rock of Gibraltar was no doubt continuous with the range of hills far over the sea to the south, and there the Magot plundered (or, rather, took what Nature let him take; for man had not then come to disturb him) the fruit of Kabylia, Algiers, and Morocco. People have invented many methods by which the Magots could come from Barbary on to the Rock of Gibraltar: some believe in a subterranean passage, which is said still to enable the occasional visits of African relations to their European kindred; and others, more practically inclined, believe that the Apes came over on board ship by stealth. Certain it is that the strong current through the Straits prevents anything from drifting from one side of them to the other. Some years since, some caves were opened and carefully examined in the Rock of Gibraltar, and the bones were found of kinds of Hyenas, of Rhinoceros, and



THE MAGOT.

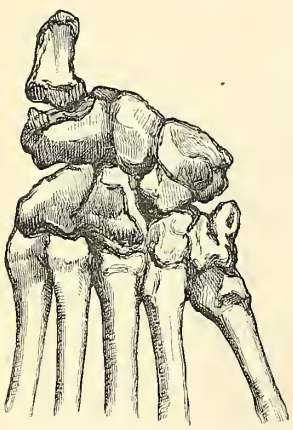
of Elephants, all comparable with those still living on the African Continent. Now, such animals could not at the present time live on the Rock, but they might have done so when it was part of a country extending right away to Africa. Their bones were washed into valleys amongst the hills, and then they fell into deep fissures and became preserved; and this could only have taken place when there was much water in the neighbourhood; and for there to be much water, the whole aspect of the country would have to be changed—to be extended far and wide where the sea now is.

No Monkey bones were found; but this is to be explained by noticing what occurs in India. There a dead Monkey is rarer than a dead Donkey in England—so rare, indeed, that the natives believe that their fellow Monkeys bury them; but the fact is there are plenty of beasts of prey ready to devour them, sick or dead, and therefore Monkey bones are very seldom found.

It is probable, then, that the Magot, and many African and some European animals, lived in the south of Spain when the Peninsula was united to North Africa. It has lasted longer than its great fellow-beasts, and still lingers there, but in greatly diminishing numbers.

What they live upon on the Rock is rather a mystery, for there are no groves of fruit-trees or

plantations to be robbed, but only roots and bulbs to be dug up. Perhaps it is this spare diet which restricts their numbers and causes them to be very watchful. It is notorious that they are rarely approached, but sometimes they are trapped, or seduced into mischief, which ends in captivity. All kinds of stories are told at Gibraltar, and by most of those who have resided there, of the acts and deeds of the Rock Monkeys. Once upon a time, a strong party of these Apes, headed by an old male, who had grown grey in audacity and mischief, were always stealing and ruining the belongings of a certain regiment in garrison, and at last the annoyance became so great that it was determined to catch the ringleader, if possible. The men caught him, and shaved his head and face, and then they let him go. Away he scampered to his party, who had been watching for him at a distance, eager, no doubt, to place himself at their head again and lead them to vengeance. He was received with a volley of sticks and stones by his own troops, who treated him so roughly that he had to fly for his life. In this deplorable and degraded state, he was fain to sneak back to his old enemies, the —th regiment, and presented himself at their quarters, so woe-begone and with such a rueful visage, "all shaven and shorn," that there was no resenting the appeal. Broderip says: "He was admitted, and remained with his new allies, whom he served with fidelity, upon the principle that secures the faith of other allies—because he couldn't help it." It is said in one of the stories of the great siege that the Monkeys saved Gibraltar as the Geese saved Rome, for the Spaniards attempted to surprise the place a few weeks before the regular siege commenced; but, fortunately for the British, the attacking party had to pass where a number of these Magots had collected. Both parties were startled at the noise, but the British were put on their guard, and the old fort was thoroughly ready for the enemy. General Elliot, afterwards Lord Heathfield, never suffered the Apes to be molested or taken; but one had been made prisoner previously to the time of his being made Governor of Gibraltar, and was kept chained in his yard. Another Monkey, who had apparently fallen from a rock, had been picked up by one of the General's aides-de-camp and conducted to the same place. Nothing could be more striking than the meeting of the pair. It was evidently the recognition of two old friends or relatives. After contemplating each other for a few seconds, they rushed into each other's arms, then pushed each other a little back, as if to make sure of the recognition, and, after a second mutual examination, again clasped each other to their breasts.



WRIST-BONES OF THE MAGOT.

The Magots, like all other Monkeys, are playful, affectionate, and gentle, when young, to those whom they know, but they become cross and vicious with age, and are generally greatly brutalised by their masters—in fact, brought to the same level.

The absence of a tail makes the Magot look very baboonish, and this appearance is not lost when the animal is dissected, and the skull is examined. This is much less animal-looking than that of any one of the Baboons, for it has not so much face, and the front of it is not so disfigured with ridges and swellings. But the forehead is "villainous low," and there are well-marked ridges over the orbits, the skull not rising behind them; and, as a matter of course, the brain case is flat, the brain itself being low in height. The palate is narrow and long, the face is flat, and the chin recedes. There is a capital set of teeth, and the last grinders of the lower jaw (third molars) have their fifth cusp, or tubercle, subdivided by two side-slits. In this, and in the tail, which is excessively rudimentary, and only has three bones, or vertebræ, the Magot departs from the usual form of the Macaques as a genus. The sutures of the face and skull—that is to say, the joinings between the bones—are soon obliterated in this animal; and it appears to have the nose (nasal) bones joined in one at an early age, thus resembling the Baboon and the carnivorous animals.

So many tricks are taught these clever Magots, and with such ease, that one would expect to find a fairly-developed brain; but an examination of one shows that it is hollowed beneath and narrow in front, whilst it is broad behind, and extending well back, and covering the cerebellum.

Their special muscular structures resemble those of the other Inui, and even their stump of a tail has the muscles which are common to those of all Monkeys, but which in this instance are useless.

It will be noticed in the engraving of the wrist-bones that one projects behind. This is the pea-shaped, or pisiform bone. It is small and at the side of the wrist in man, but here it acts like a front *heel* bone. The length of the three middle long bones of the palm, or metacarpals, is nearly equal; and this is an interesting point, as it prevents the third finger from being so much the longest, and gives the hand more or less a foot-like appearance.

THE WANDEROO.*

Wanderoo is the English way of spelling and pronouncing the word by which the native inhabitants of Ceylon call all Monkeys; and it is certainly misapplied in this instance, for the animal is not truly one of the Cingalese Monkeys, although it has been brought into the island. It lives in the neighbouring part of the south of the peninsula of Hindostan, especially in the country bordering the Malabar coast. It is a small animal, probably never reaching two feet in length, and the tail may be that of ten or twelve inches; but, from the stories which have been told and invented, one would conceive the Wanderoo to be a giant in wickedness as well as in physical power.

FACE OF THE WANDEROO.

They have slim bodies, which are covered with deep black hair, and there is a longish tail of the same colour, ended by a little tuft. Their head looks very large, because of a mane, or ruff, and beard which surrounds the face, sticking out in a wild kind of way. This mass of long hair is either grey or white in colour, and adds to the sly look of the broad face, soft dull eyes, and rather long black muzzle.

A former dignitary of the Roman Catholic Church, the Procurator-General of the Barefooted Carmelites, Father Vincent Maria, writes that there are four kinds of Monkeys on the coast of Malabar, and then proceeds to describe the Wanderoo. He says that this is perfectly black, is clothed with glossy hair, and has a white beard round his head and chin, measuring rather more than a palm in length. To him all the other Monkeys show such deep respect, that in his presence they are submissive, and humble themselves as if they were aware of his pre-eminence. The princes and great lords esteem him highly, for that he is, above every other, gifted with gravity, capacity, and a wise appearance. Easily is he taught to perform a variety of ceremonies and courtesies, and all these in so serious and perfect a style as to make it a great wonder that they should so exactly be enacted by an irrational animal. This excellent character does not appear to have been peculiar to all the Wanderoos; for some have been described as savage and disgusting in the extreme, and as most vicious and malignant in captivity. But it is probable that the gentleness of disposition which has been so noticed by those who have kept them kindly was spoiled by teasing and maltreatment.

The showmen call this Monkey the "Child of the Sun;" and Broderip suggests that it is the ruff, with the head peeping through, which gives a faint likeness to old Sol over a public-house door: and that probably the dark colour of the animal impressed his exhibitors with the great heat he enjoyed in his Indian home.

* *Macacus Silenus.*

Certainly they like the sun; and we have often seen a pair at the Zoological Gardens sunning themselves after their breakfast with great delight. They sit on a bar, close to the wires of the cage, and climb four or five feet up it, clinging close to their iron prison, just in the range of a sunbeam. They spread out their black hands, and enjoy the glare, becoming sleepy and disinclined to pay any attention to nuts, cakes, and other temptations. They peer down at you with their expressive eyes, and give an occasional twist to their tail, to pull it close to them, probably after a long experience of the habits of the other Monkeys in the cage, who certainly have not an overwhelming respect for them. It is curious to see them climbing slowly, and without the great exertion and bounds of some of the Guenons, and to notice their marching, head and back downwards, whilst they crawl along the under-side of the roof of their house, looking down every now and then in a cunning sort of manner.

Broderip used to watch one, when the Zoological Society's collection was in its infancy in Bruton

THE WANDEROO.

Street, and a right merry fellow was he. "He would run up his pole and throw himself over the cross-bar, so as to swing backwards and forwards as he hung suspended by the chain which held the leathern strap that girt his loins. The expression of his countenance was peculiarly innocent; but he was sly—very sly—and not to be approached with impunity by those who valued their head-gear. He would sit demurely on his cross perch, pretending to look another way, or to examine a nut-shell for some remnant of kernel, till a proper victim came within his reach; when down the pole he rushed, and up he was again in the twinkling of an eye, leaving the bare-headed surprised one, minus his hat, at least, which he had the satisfaction of seeing undergoing a variety of transformations, under the plastic hands of the grinning monster, not at all calculated to improve a shape which the taste of a Moore (the hat maker of the day), perhaps, had designed and executed. It was whispered—*horrescimus referentes*—that he once scalped a bishop, who ventured too near, notwithstanding the caution given to his lordship by another dignitary of the Church, and that it was some time before he could be made to give up, with much grinning and chattering, the well-powdered wig which he had profanely transferred from that sacred poll to his own. The lords-spiritual of the present day, with one or two exceptions, are safe from such sacrilege. Now it would be nearly as difficult to take a wig off a bishop as it once was to take the breeches off a Highlandman. But another Wanderoo, confined in the open part of the

gardens in the Regent's Park, was of a different temperament. There was a melancholy about this creature. He would climb his pole, ascend to his elevated house-top, and there sit for half an hour together, gazing wistfully at the distant portion of the park—which presented, when viewed from his position, the appearance of a thick wood—every now and then looking down, as if he was contrasting the smooth, sharp-pointed pole, to which they fettered him, with the rugged, living 'columns of the evergreen palaces' of his fathers." The Wanderoo often loses some of his tail in captivity; but it should be, when full-grown, terminated by a tuft, which, in the imagination of some, has been considered quite lion-like. Having large cheek-pouches, this Monkey, very un-lion-like in disposition, feeds rather rapidly, and stores away much for future occasion. In doing this it either carries the food to the mouth with the hand or places its mouth to the object. It moves on all-fours, and has callosities; and these, and the tail, give it a very baboon-like appearance. Nothing is known of their habits in their wild state.

The geographical range of the Inui, or Macaques, is very great, and some of the twenty-seven species of which the genus is composed have very restricted wandering grounds, whilst others are found over a wide extent of country. As a group, they are found from North Africa to China, and species are met with at Gibraltar and Eastern Thibet, and within range of the everlasting snow. They are found in the peninsulas of India, and in the great islands as far south-west as Timor and in the Philippines, but not in Celebes or in New Guinea.

CHAPTER VIII.

THE DOG-SHAPED MONKEYS (*continued*)—5. THE BABOONS.*

Early Accounts of the Baboon—Origin of the Name—Held as Sacred by the Egyptians—Used as the Emblem of Thoth—Brought into Europe in the Middle Ages—Their Literature—General Description of the Family—Structural Peculiarities—Brain—Skull—Geographical Distribution—THE SACRED BABOON—Found in great numbers in Abyssinia—Formidable Antagonists—Size and Colour of the Male and Female—Anecdotes—Propensity for Spirituous Liquors and Thieving—THE GELADA BABOON—THE PIG-TAILED BABOON—Usually called Chacma—Description of it—Its Ferocity in Captivity—Le Vaillant's Monkey—THE SPHINX BABOON—Its Dexterity of Aim—THE ANUBIS BABOON—Its Locality and Food—Method of Running—THE COMMON BABOON—Often Found in Captivity—Anecdotes—Anatomical Peculiarities.

JOHN LEO, an ancient traveller, who wrote about his perils and adventures in "his nine bookes," says, regarding his experience of Africa, that "of Apes there are divers and sundry kinds, those which have tayles being called in the African tongue *Manne*, and those which have none *Babuini*. They are found in the woods of Mauritania, and upon the mountains of Bugia and Constantia. They live upon grasse, and come and goe in great companies to feed in the cornfields; and one of their companie, which standeth centinelle or keepeth watch and ward upon the borders, when he espyeth the husbandmen comming he cryeth out, and giveth, as it were, an alarm to his fellows, who every one of them flee immediately into the next woods, and betake themselves to the trees. The shee Apes carry their whelpes upon their shoulders, and will leape with them in that sort from one tree to another."

This author, although he probably mixed up other Monkeys with his *Babuini*, gives the key to the derivation of the word baboon, which has been the subject of keen controversy amongst those who are curious in such matters. *Papio* is the common term applied to these animals by the writers of the fifteenth and sixteenth centuries; it is "dog latin" for *Babbo*, which in modern language would be rendered *Papa*, and *Babuino* is the diminutive of *Babbo*. Doubtless these terms bear some important and hidden reference to the opinions of the African races upon their relationship and connection with the clever Apes, and upon their appreciation of the paternal habits of the patriarchs of the great

* *Cynocephalus.*

companies who not only stand "centinelle," but instil good discipline into the younger members of the family.

But long before John Leo lived, these *Babuini* had been noticed and critically observed by Greek and Roman naturalists, and had received, on account of their especial character—their dog-shaped muzzle and head—the name Cynocephali, or Dog-headed Apes. The word comes from the Greek κῦνο-κέφᾶλος, which was applied to Dog-headed people as well as Apes, and it is very applicable, for the whole aspect of the head, and especially of the prolonged snout, cut short at the end in the Ape, greatly resembles that of some Dogs. Earlier still, the ancient Egyptians engraved its figure in stone, made metal images of it, drew it on papyrus, and even made mummies of their dead bodies. Hermopolis was especially the city devoted to the worship of the Dog-headed, for in those early days such was their grandeur in Egyptian eyes, and such the folly of mankind. Symbolism was carried to an excess, its foundations being as mysterious as meaningless, and it therefore came to pass that the Dog-headed were mixed up with literature and astronomy.

That admirable investigator and popular exponent of the sculptures and hieroglyphics of the ancient Egyptians, Sir Gardner Wilkinson, writes that "The Cynocephalus Ape, which was particularly sacred to Thoth, held a conspicuous place among the sacred animals of Egypt, being worshipped as the type of the god of letters, and of the moon, which was one of the characters of Thoth. It was even introduced into the sculptures as the god himself, with 'Thoth, Lord of Letters,' and other legends inscribed over it; and in astronomical subjects two Cynocephali are frequently represented standing in a boat before the sun, in an attitude of prayer, as emblems of the moon. Their presence in a similar boat with a Pig probably refers to them as types of the divinity, in whose honour that animal was sacrificed; the moon and Bacchus, according to Herodotus, being the sole deities to whom it was lawful to immolate Swine, and that only at the full moon. But the presence of Cynocephali was not confined to Thoth or the moon. On two sides of the pedestals of the obelisks of Luxor four Cynocephali stand in the same attitude, as if in adoration of the deity to whom those monuments were dedicated; a balustrade over the centre doorway of the temple of *Amun* at Medeeret Haboo, is ornamented with the figures of these animals; and a row of them forms the cornice of the exterior of the great temple dedicated to *Ra* at Aboomubel. Sometimes a Cynocephalus placed on a throne as a god holds a sacred Ibis in its hand; and in the judgment-scenes of the dead it frequently occurs seated on the summit of the balance as the emblem of Thoth, who had an important office on that occasion, and registered the account of the actions of the deceased. The place where this animal was particularly sacred was Hermopolis, the city of Thoth. Thebes and the other towns also treated it with the respect due to the representative of the Egyptian Hermes, and in the necropolis of the capital of Upper Egypt, a particular spot was set apart as the cemetery of the sacred Apes. Mummies of the Cynocephalus were put up in a sitting posture, which is usually that given to the animals in the sculptures when representing the god Thoth; and its head forms one of the covers of the four sepulchral vases deposited in the tombs of the dead. It was then the type of the god *Hopi*, one of the four genii of *Amenti*, who was always figured with the head of a Cynocephalus. Many of this species of Ape were tamed and kept by the Egyptians, and the paintings show that they were even housed for useful purposes."

Elsewhere the same author informs us that "the Cynocephalus is synonymous with the hieroglyphic of letters; and we even find it holding the titles and fulfilling the office of Thoth, which shows that it was not only the emblem, but also the representative of the deity." "Thoth in one of his characters corresponded to the moon, and in the other to Mercury. In the former he was the beneficent property of that luminary, the regulator and supervisor of time, who presided over the fate of man and the events of his life; in the latter the god of letters and the patron of learning, and its way of communication between gods and men. It was through him that all mental gifts were imparted to man. He was, in short, a deification of the abstract idea of the intellect, or a personification of the intellect of the deity."

The judgment-scenes found in the tombs and on the papyri show that the good actions of the deceased are placed in a row on one side of the balance, and the figure or emblem of Truth on the other. Anubis, the director of the weight, proceeds to ascertain the claims for admission into the region of Amenti, and if on being weighed he is found wanting, he is rejected, and Osiris, the

judge of the dead, inclining his sceptre in token of condemnation, pronounces judgment upon him, and condemns his soul to return to earth, under the form of a Pig, or some other unclean animal. Placed in a boat, it is removed under the charge of two Monkeys, who open out to it a new term of life. The Monkeys drawn have tails, and are evidently Dog-headed.

Baboons were brought from Africa, and sold in all directions in Europe by the merchants of the Middle Ages, and it was thought to be out of the fashion not to have an Ape in one's establishment. They were dressed up, and sometimes admitted to feasts, and taught manly kinds of tricks and good behaviour. Broderip hunted up an odd story, which refers to an Ape in the sixteenth century, which did a vast deal of mischief very unintentionally. In the play of *Much Ado About Nothing*, Benedick is said by Beatrice to have stated that she got her wit out of the Hundred Merry Tales—

> "And that I had my good wit out of the Hundred Merry Tales."

CYNOCEPHALUS. (*Egyptian Monuments.*)

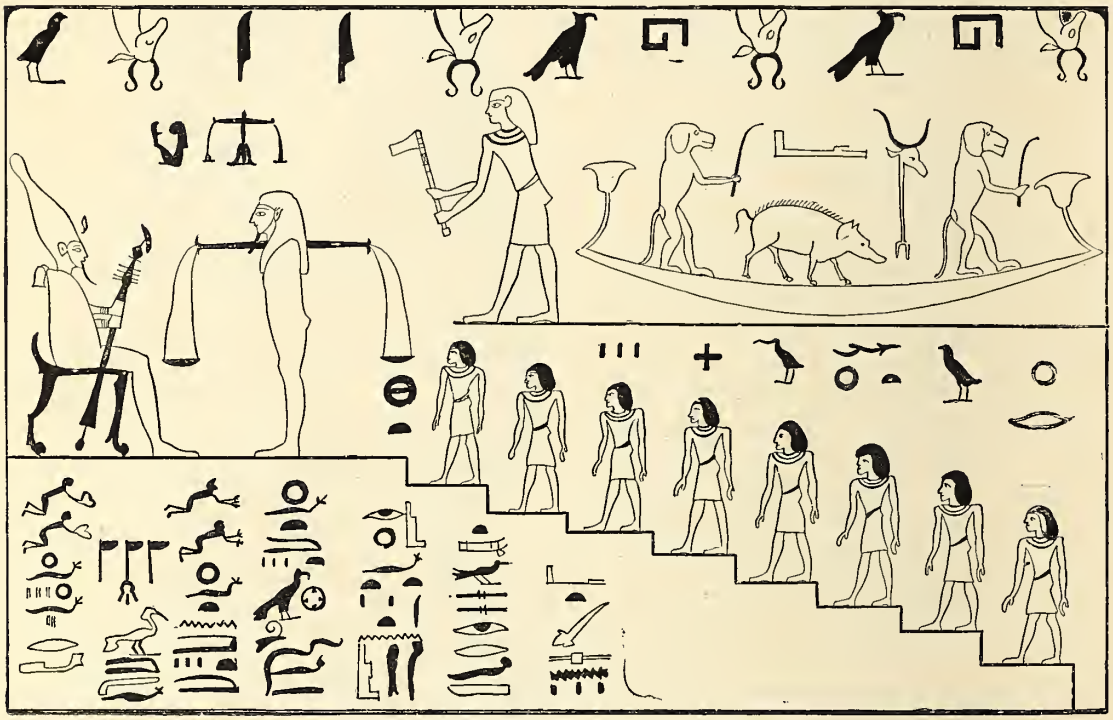
What this book was could hardly be decided; some thought that it was Boccaccio's "Decamerone," but they appear to have been printed by John Rastell, the title being, "A C. Mery Talys." The wit is well enough in these "tayles" to make Benedick wince under Beatrice's imputation. One story is headed, "Of the Welcheman that delyvered the letter to the Ape." The first lines are wanting, but there is enough to make it appear that a master sends his Welsh retainer with a letter to the chief justice, in order to obtain a favour for a criminal who had been in the writer's service, with directions to the said Welshman to return with an answer. "This Welcheman came to the chefe justyce place, and at the gate saw an Ape syttynge there in a cote made for hym, as they use to apparell Apes for disporte. This Welcheman dyd of his cappe, and made cortsye to the Ape, and said, 'My master recommendeth him to the lord your father, and sendyth him here a letter.' This Ape toke this letter and opened it, and lokyd upon the man, makynge many mockes and moyes as the propertyes of Apes is to do. This Welcheman because he understood him not, came agayne to his master, accordynge to his commandes, and told hym he delyvered the letter unto the lorde chief justice sonne, who was at the gate in a furred cote. Anone hys master asked him what answer he brought. The man sayd he gave him an answer, but it was French or Laten, for he understode him not. 'But syr,' quote he, 'ye nede not to fere, for I saw in his countenance so muche that I warrant you he wyll do your errand to my lorde his father.' This gentleman in truste thereof made not any further suite, for lacke thereof his servaunt that had done the felonye within a month after was rayned at the king's benche and corte, and afterwards hanged." In the punishment for matricide the criminal was placed in a case with an Ape, Cock, and Serpent, and either buried alive or drowned; and the dislike of the first two creatures was much enlarged upon in some ancient authors.

In the *Merchant of Venice* there is allusion made to the fanciful notion of Monkey—and probably it was Ape—keeping. Shylock has lost his daughter, and Tubal comes to give him news of her fast living, and of Antonio.

Tubal. One of them showed me a ring, that he had of your daughter for a Monkey.

Shylock. Out upon her! Thou torturest me, Tubal: it was my turquoise; I had it of Leah, when I was a bachelor: I would not have given it for a wilderness of Monkeys.

In a "New History of Ethiopia, being a full and accurate description of the Kingdom of



JUDGMENT-SCENE FROM AN EGYPTIAN MONUMENT.

Abyssinia, vulgarly" (writes Broderip), "though erroneously, called the Empire of Prester John, by the learned Job Ludolphus" (1682), there is a grand engraving of Apes, with this superscription:—

"1. Scrambling about the mountains.
2. Remoeving great huge stones to come at the wormes.
3. Sitting upon Ant-hills and devouring the little creatures.
4. Throwing sand or dust in the eyes of wild beastes that came to sett upon them."

The following is illustrated by the above:—

"Of Apes there are infinite flocks up and down in the mountains thereabout, a thousand and more together: there they leave no stone unturned. If they meet with one that two or three cannot lift, they call for more, and all for the sake of the wormes that lye under: a sort of dyet which they relish exceedingly. They are very greedy after Emmets; so that having found an Emmet-hill, they presently surround it, and laying their fore paws with the hollow downward upon the Ant-heap, as fast as the Emmets creep into their trecherous palmes, they lick them off with great comfort into their stomachs; and there they will lye til there is not an Emmet left. They are also pernicious to fruit and apples, and will destroy whole fields and gardens unless they be carefully looked after. For they are very cunning, and will never venture in till the return of their spies, which they send always before, and who, giving information that all things are safe, in they rush with their whole body, and make a quick dispatch. Therefore they go very quiet and silent to their prey, and if their young ones chance make

a noise, they chastise them with their fists, but if they find the coast clear, then every one has a different noise to express his joy. Nor could there be any way to hinder them from further multiplying, but that they fall sometimes into the ruder hands of the wild beasts, which they have no other way to avoid but by a timely flight, or creeping into the clefts of the rocks. If they find no safety in flight, they make a virtue of necessity, stand their ground, and filling their paws full of dust or sand, fling it full in the eyes of their assailant, and take to their heels again."

It will be seen that there is much truth and a great deal of romance in this narrative.

The Baboons have had their name given by the Dutch to a plant. The "*Babianer*," which

BABOONS UPON AN ANT-HILL. (*From Job Ludolphus*, 1682.)

botanists have turned into the genus *Babiana*, is a common group of plants which is found in South Africa.

One kind, the *Babiana Sulphurea*, greatly resembles in its flower the common Gladiolus of our gardens, but it has round, stiff-coated seeds. The sword-shaped leaves arise from an underground bulb-like root, which buds near its point so as to rise in the ground to the surface, and the flowers are very handsome. The plants flourish in the soil of the great plains of the Cape of Good Hope, where they are exposed for two or three months to rain, but where afterwards and for the rest of the year the earth becomes so dry that hardly a vestige of vegetation remains. The Baboons, when they roamed over these plains formerly, used to dig up the root and eat it voraciously.

The Baboons are more brute-like than the rest of the Monkeys in appearance, and therefore have not that singular resemblance to man which many of the others possess either generally or in their faces. Their dog-shaped head, a long muzzle, and a curious fulness on either side of the long nose, distinguish them at once from any other Quadrumana. With one or two exceptions the nostrils are quite at the end of the muzzle, and are separated by a narrow piece of gristle; they rather project beyond the nostril, and can be placed close to the ground as the Baboon runs along to follow or track a

scent. Their eyes are close together, and are deeply set, their ears are moderately large, and their neck is rather long, and as their common position is squatting on the hinder quarters like a Dog, the long muzzle is kept straight out, or occasionally is hung down over the chest. They have a short body, which seems compressed at the sides, and the shoulders are wide, the chest being capacious. As they run very much like Dogs, the hind-quarters are strong, and the hinder limbs longer than the front ones, and have a decided heel and strong muscles. They trot and canter, but rarely bound or jump over the ground, and they scramble and climb up rocks with the aid of the power of prehension, which is great even in the hinder extremities, the thumb being strong but short. When standing on all-fours, the shoulders are high, and the body slopes slightly to the tail, which is stuck high up, and some have short and others long tails.

They have the cheek-pouches, and the curious callosities on their stern, which sometimes are very large and vividly coloured; and their hair is many-coloured, being long or short according to the species. The tail is curved upwards close to its origin, and then it droops downwards when the Baboon is quiet in mind and body; but when excited, it sticks out and is flourished about with great vigour. Sometimes ended with a tuft, in some kinds it is not, and in one or two of the great Dog-headed there is no tail, or only a miserable rudiment of it. In spite of their brutal looks—for the faces of some are swollen out, or rather the side of the nose, and coloured and ridged in a marvellously ugly manner—they are very interesting, on account of their habits, cleverness, sociability amongst themselves, and their courage. Usually very amiable and full of fun when young, they afford much amusement when kept well and treated with kindness. They like to be petted, and will present their backs to be scratched, and may be taught to beg for food, to hold things, and to play endless tricks. This "jolly" disposition is seen amongst the wild youngsters, who are ever on the watch for an occurrence of mischief and practical joking, the sedate behaviour of their elders affording opportunities for endless mummeries and impudences. What can be more tempting to a young and light-hearted Cynocephalus than to disturb the solemn thoughts of the patriarch of the troop? There sits the elder of elders on his haunches, his tail outspread behind, the long nose slightly stuck up, and the fine long mane, lion-like, encircling the throat and covering the shoulders. Perched upon a block of stone, higher than the rest, he is an object of reverential awe to the elders of the band. But often enough some restless little Ape, after squatting on a stone and mimicking the Nestor of the tribe, forgets himself, and after much dodging here and there, and running to and fro, ventures to pull that sacred tail as only Monkeys pull. All the rage of Thoth is, however, slumbering in that quiet old male. His cares and watchings have triumphed over any gaiety he ever had. Making no allowances for the follies of youth, he pounces without wavering on the offender. Squeals, squeaks, and howls follow the cuffs, pinches, and bites, and the little wretch makes off to the bosom of his mother, who snarls, grins, and shows her teeth, using language awful in monkeydom, and mutterings not loud but deep. The mothers in the immediate neighbourhood sympathise and proclaim their indignation with low grunts and much pantomime suggestive of reprisals, but they all know better than to do anything of the sort, as they have experienced the weight of the paternal arm themselves so often.

With age, any amiability of disposition is replaced by ferocity and greedy brutality, and is particularly increased in captivity, as the temper is usually severely tried by the tricks and teasings of the visitors.

The Cynocephali, although they are placed after the different genera already described in the scheme of classification, have some very singular structural resemblances with the higher Apes and with man, besides those which render them more like the quadrupeds, such as the flesh-eaters or Carnivora. Several of these will be noticed in describing some of the kinds of Baboons; but it may be stated here that the bend in the back observed in the Chimpanzee and other Apes, which resembles that of a very young child more than that of a man, does not exist in these Dog-headed Apes. Their bones bend in and the upper part of the back bends out, as in man, so that there is a more or less graceful double curve. This is evident when any Baboon places himself up against the wires of his cage to be scratched—a treat under all circumstances. Moreover, the Baboon has another human resemblance, which is also observable in the Orangs, but not in the Troglodytes. In man, if a line be drawn down the spine and another drawn down the sacrum bone (that which unites the haunch-bones together behind), they will not meet and form a straight line, but will cut

each other, so as to produce a decided angle. This is slightly seen in the Orangs, but it is very evident indeed in the Baboons. On the contrary, there is no angle formed in the Gorilla and Chimpanzee. Again, in man, the sacrum bone is curved, the hollow of the bend looking forwards. This is the case in the Baboon and also in the Siamang; but the curvature is much less in the great Apes or Troglodytes; furthermore, this sacrum bone is relatively very broad in the Baboon.

Now, these are not simply anatomical curiosities, and they are really of some interest to the youngest naturalist who cares to try and puzzle out what these things really mean. Either they have a meaning or they have not. If they are freaks of Nature or the results of chance, then there is nothing more to be said; or if they are deeply connected with the method of life or the habits of the creatures, they may be said to have been given for a purpose. But the notions about chance and freaks belong to a bygone age, for Nature works neither by accident nor by impulses, but by law. So there must be some meaning in these things, and the key to their comprehension is the gradual change of form and of structure which has been undergone in the long ages during which one animal has become altered so as to depart greatly from the parent stock, and to assume what is called a new specific shape—to become a new kind. And in the new kind there are relics of the old form—pieces of bone here and there; muscles, tendons, or useless teeth, and such things, which are, as it were, part of the coat-of-arms to enable the genealogist to trace the history of the family.

In the Baboons there is a curious condition of the first bone of the neck (the atlas, or first vertebra, on which the head rests). It is a massive ring of bone, down the centre of which the great nerve (spinal cord) of the spine passes, and it becomes stouter with age, and the central hole is all the smaller. It has a small spinous process, to which there is a muscular attachment, which tends to keep up the heavy skull and long nose. A good short back-bone, not over pliant, is necessary to the Baboon, and a provision is made in order to produce this; for the bodies of the vertebræ are found to be larger and longer as they are further down the spine. This is what occurs in man and in the Gibbons, but it is only slightly noticed in the higher Apes—the Troglodytes and Orangs. The Baboon may be said to have sometimes only eighteen back and loin vertebræ, and twelve or thirteen are rib-bearing, and the spines of these bones are strong and often expanded or flattened at their ends; moreover, the last spines project forwards and the others backwards. All this arrangement is especially ape and animal-like, and refers to the strenghtening of the muscles used in moving on all-fours. There is of course a tail to be considered, and in the shortest there are from five to eight bones, or modified vertebræ, and whether short or long, the muscles of the tail are all to be met with at its root.

Such clever animals ought to have well-formed brains, and yet not so elaborately constructed as those of the Anthropomorpha, whose movements are more varied, and who can walk erect for a longer or shorter time. It is found that the brain of the Baboon, although less complicated, or rather less perfectly formed, than that of the Chimpanzee and Orang, is singularly like those of the Guenons and Macaques in the surface markings and convolutions, and, in fact, the brains of these animals agree in all essential points. The principal convolutions and fissures which are noticed in the Troglodytes exist, but the external perpendicular fissure is strongly marked, and all the little brain is covered by the cerebrum, or brain proper.

There is no mistaking a Baboon's skull; it is large for a Monkey, and the face part is always one-half of the whole, the brain case being cast in the shade, as it were, by the huge upper and lower jaws, and their fine armament of teeth. In old males the length of face is much greater than one-half, and the front of the upper jaw is stuck out considerably. But in all there is a swelling of the upper jaw-bone, just in front of the orbit and on either side of the nose-bones, which sometimes is vast and at others turned into a ridge. It is this which is covered by the curious tints and colours in some. The jaws seem pinched in, just above the upper grinding teeth, and then comes this swelling. Strong teeth exist in the upper jaw, and the canine, or eye teeth, more than an inch in length, are long, slender, curved, and sharp. The front or incisor teeth are large, the middle ones being the largest, and the three grinders have sharp projections on them which are not readily worn. As the eyes are close together, the orbits are only separated by the forehead (frontal) bone and the united nose-bones (nasals). These cavities are, moreover, broad, and look a little outwards, and they open into the strange swollen muzzle. The ridges over the orbits are great, and the opening for the nose is

triangular; the forehead recedes, and is rounded, and the side-bones of the brain case are bulged out. Underneath, the skull looks very long; the hinder nostril opening is small, and the palate is arched. As the animal eats a variety of food, and fights often, his lower jaw is very strong. It is large and wide behind, and compressed in front. The chin is deep, and so is the side of the jaw close to it, but further back it is less so; and the joint process (condyle) is wide and very flat usually. The lower canines are not as large as the upper, and they fit into a space (diastema) in front of the great canines of the upper jaw. The back teeth are remarkable for their size, the last in the lower jaw having five points, and the others four. The tooth (pre-molar) next to the canine is pushed backwards and sharpened in a curious manner by the action of the great upper canine, which comes down in front of it when the jaw is closed.

The Baboons are found widely dispersed about Africa, and those which have been best observed live on the west coast, on the east in Abyssinia, and extending downwards to the neighbourhood of the Cape of Good Hope. Frequenting mountains and woody places, and rather avoiding forest land, they come within range of the great Carnivora of the plains and uplands, and suffer in consequence, the Leopard especially making the young its prey whenever it has an opportunity. They extend into Arabia. A little black one, differing in its kind from its African congeners, lives in the Island of Celebes, in the Philippines, and in the Islet of Batchian, close by. Some kinds differ but slightly from one another, and those of one part of the African continent appear to resemble those of other portions in their several shapes and habits, and yet to have different coloured hair, hence much confusion has arisen regarding the races of the species of the genus. This has been increased by the fact that the females differ much from the males, and hence more species have been formed by naturalists than is correct. Probably there are twelve species.

BRAIN OF THE BABOON.

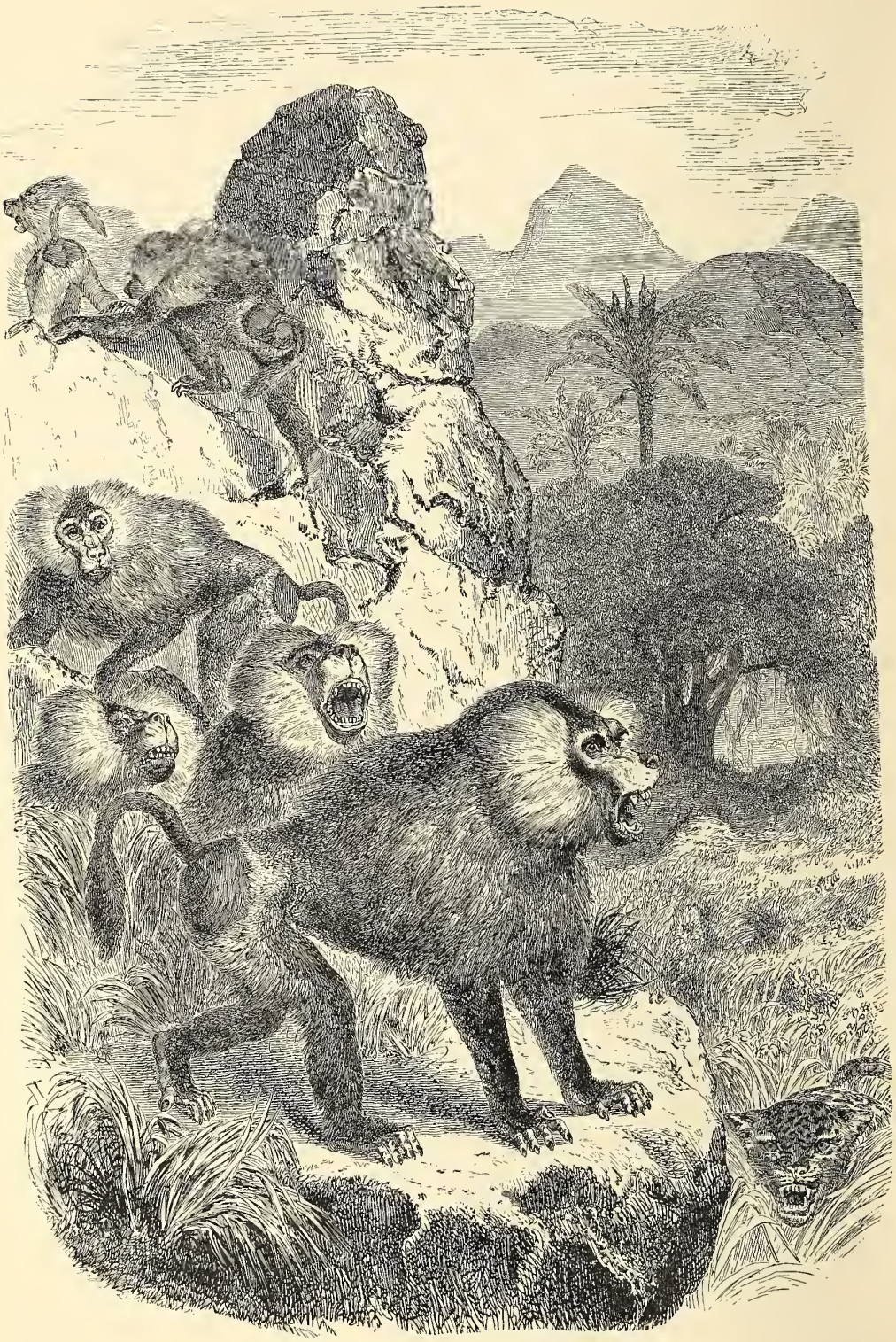
The possession of a good tail constitutes a very good characteristic, and by the presence or comparative absence of this member the group or genus may be divided into two.

In the division which possess a tail, which is never very long, often rather short, and sometimes tufted and sometimes not, are the most numerous species, and such kinds as the Hamadryas, Gelada, Sphinx, and Pig-tailed Baboons are well known. In the nearly tail-less division are the great Mandrill, the Drill, and the Black Baboon.

THE SACRED BABOON, THE THOTH OF THE EGYPTIANS.*

During the march against Magdala and Theodore, in the Abyssinian campaign, this great Dog-faced Baboon was frequently seen, and its habits were noticed by Blanford, the naturalist to the Expedition. Like most, if not all, of its fellow Baboons, this interesting creature prefers sandy ground to the dense forest land. They very rarely are seen on trees, they avoid woods, and keep mainly in the open country, preferring rocky precipices. This was the kind of country principally traversed by the army, and hence the Baboons afforded some amusement during the hot marches, and they were met with everywhere from the plains around Annesley Bay, where the disembarkation took place, to the top of the Dalanta plateau, although most abundantly in the tropical and sub-tropical portions of the district. On rising one morning after a march of some sixteen miles from Annesley Bay, Blanford saw a singular spectacle. A large troop of Baboons, at least two hundred in number, were hunting for any corn dropped upon the ground in the place where the horses had been picketed. They were the first of the great Dog-faced Apes which had been seen, although they became familiar enough afterwards. There was no mistaking them, for their likenesses to the engravings of the Sacred Ape

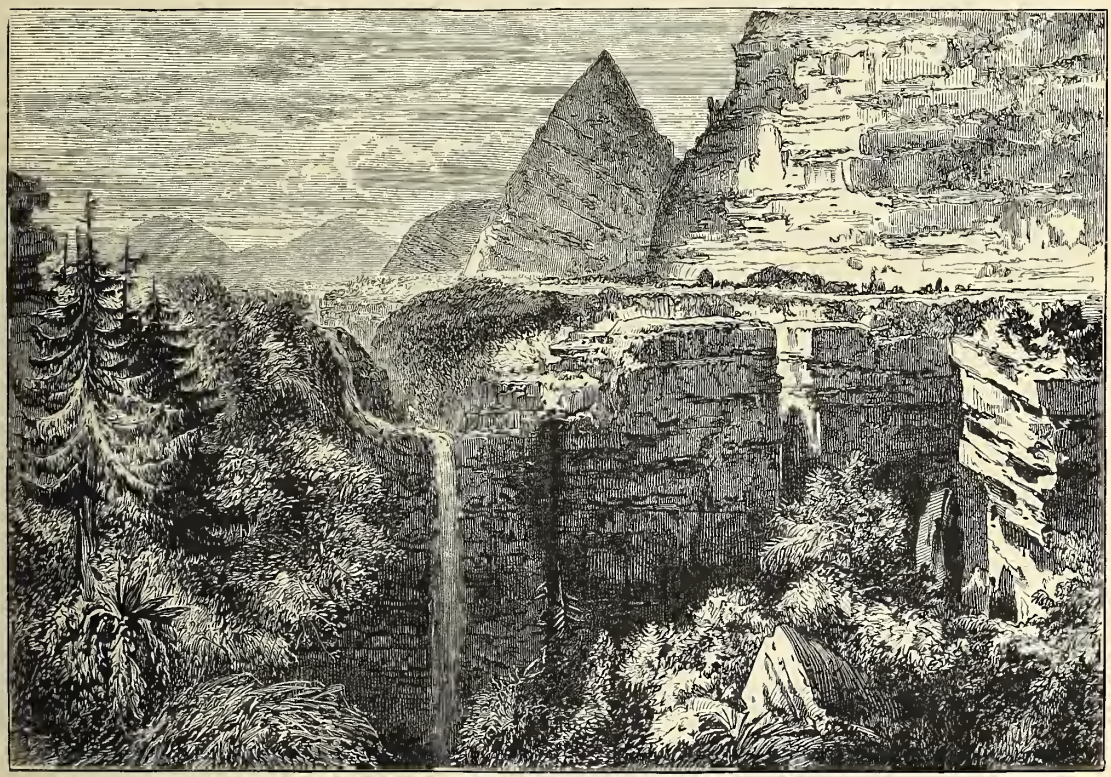
* *Cynocephalus Hamadryas.*



THE SACRED BABOON.

(Thoth) on Egyptian monuments was exact. The uncouth-looking male is, indeed, a formidable-looking animal, something between a Lion and a French Poodle in appearance, with long hair over his shoulders and fore-parts. Their impudence was excessive, and the day before they had come into the commissariat enclosure and commenced pilfering the grain.

Subsequently the Baboons were found up the country, at an elevation of 9,000 feet, and wherever there were passes leading from the coast to the table-lands, there they abounded, and it was evident that they kept close to the sides of the rocky ravines. The herds vary in number; some cannot include less than 250 to 300 Monkeys of all ages. The old males are always most conspicuous animals, all the fore-part of their body being covered with long hair. They usually take the lead when the troop is moving, some of them also bringing up the rear; others placing themselves on high rocks or



VIEW IN ABYSSINIA.

bushes, and keeping a sharp look-out after enemies. A troop collected on a rocky crag presents a most singular appearance. Sometimes large numbers were seen assembled around springs in the evening near Senafé, where the want of water was great. On such occasions, every jutting rock and every little stone more prominent than the rest was occupied by a patriarch of the herd, who sat with the gravity and watchfulness befitting his grizzled hair, waiting patiently until the last of his human rivals had slaked his thirst and that of his cattle. Around, the females were mainly occupied in taking care of the young, the smaller Monkeys amusing themselves by gambolling about. Occasionally, if a young Monkey became too noisy, or interfered with the repose of one of his seniors, he "caught it" in most unmistakable style, and was dismissed with many cuffs, a wiser if not a better Monkey. It feeds on wild fruits, berries, and seeds, and often on the buds of trees and on young shoots. On the highlands, troops of them were frequently seen in the fields, engaged in searching for a small tuber, the root of the edible *Cyperus*, which was also the resource of the half-starved men and women in the country of the Tigré.

These Baboons climb heavily and clumsily, but run, or rather gallop, well and steadily, without

bounding movements, and hence their locomotion differs much from that of many kinds of Monkeys. Doubtless they unite in such large troops in order to defend themselves against their enemies, and the old males are combative and grave. From their size and great power of jaw they are most formidable antagonists, and their boldness in resenting injury is said to be in proportion to their power. There are many stories of their attacking men. During the time before the Abyssinian Expedition sailed, a well-known German and two companions were surrounded by a large herd, which barred their path, and were so threatening that he was obliged to shoot one in self-defence. Even then, although they fell back, they did not run away. On the other hand, there were no instances known of these Baboons attacking any other of the expeditionary force. Near the passes the Baboons became very wary, for they were often fired at.

The Hamadryas Baboons are not entirely vegetable feeders, although they usually live on fruits and grain, or on buds and succulent stems; yet it appears to be true that they like insects now and then, and share them as delicacies. The old ones march about gravely, turning over stone after stone, but if there is a large stone which one cannot turn over, as many as can stand round it turn it with a will together, capsize it, and share the booty. The old males, who act as sentinels, are extremely watchful, and cry out with a peculiar note when there is danger; but this is only done when absolutely requisite, for silence is insisted on during their expeditions. Thus, when they plunder a garden in Abyssinia, they follow their leader without noise, and if an impudent young one makes a noise he receives a slap from the others to teach him silence and obedience. But as soon as they are aware that there is no danger, all show their joy by making as much noise as possible.

The Hamadryas grows to the size of a large Pointer Dog, and measures rather more than four feet when standing erect, and about two feet and a half when sitting. The face is very long, naked, and of a dirty flesh-colour, with a ring of lighter tint round the eyes. The nostrils, as in the Dog, are separated by a slight furrow, and they open quite at the end of the snout, which projects slightly beyond the lip. The head, neck, shoulders, and all the fore parts of the body as far as the loins are covered with long shaggy hair; that on the hips, thighs, and legs is short, and contrasted with the former has the appearance of having been clipped, so that the whole animal bears some resemblance to a French Poodle. The hair of the back of the head and neck is upwards of a foot in length, and forms a long mane which falls back over the shoulders, and at a distance looks something like a full short cloak. The whiskers are broad and directed downwards so as to conceal the ears; their colour, as well as that of the fore part of the body, head, and mane, is a mixture of light grey and dusky colour, each hair being marked with numerous delicate rings of the colours. The short hair of the thighs and extremities is of a uniform colour of dusky brown, and a dark brown line passes down the middle of the back. The feet are rusty brown, and the hands are jet black. The tail is about one-half of the length of the body, and is carried drooping as in other Baboons; it is terminated by a tuft of long brown hair.

The female equals the male in point of size, but has no mane, being uniformly covered with short hair of deep olive-brown slightly mixed with green. She has a bearish look, and it is evident that the colours of both sexes are admirably adapted to hide them when crawling amongst rocks, or hiding away in holes and under ledges of stone. All have a wild, grunting bark, almost approaching a roar; and they possess laryngeal pouches or air sacs, which pass amongst the muscles of the neck and reach even into the armpits. The pouch communicates by one opening into the membrane above the larynx, and between its cartilage and the so-called hyoid bone at the base of the tongue, and they, therefore, resemble those of the Semnopitheci.

Mansfield Parkyns gives some very interesting and explicit statements about the intelligence and discipline of the Baboons. He says—"The Monkeys, especially the Cynocephali, who are astonishingly clever fellows, have their chiefs, whom they obey implicitly, and a regular system of tactics in war, pillaging expeditions, robbing cornfields, &c. These Monkey forays are managed with the utmost regularity and precaution. A tribe coming down to feed from their village on the mountain (usually a cleft in the face of some cliff) brings with it all its members, male and female, old and young. Some—the elders of the tribe distinguishable by the quantity of mane which covers their shoulders, like a Lion's—take the lead, peering cautiously over each precipice before they descend, and climbing to the top of every rock which may afford a better view of the road before them. Others have their

posts as scouts on the flanks or rear, and all fulfil their duties with the utmost vigilance, calling out at times, apparently to keep order among the motley pack, which forms the main body, or to give notice of the approach of any real or imagined danger. Their tones of voice on these occasions are so distinctly raised, that a person much accustomed to watch their movements will at length fancy—and perhaps with some truth—that he can understand their signals.

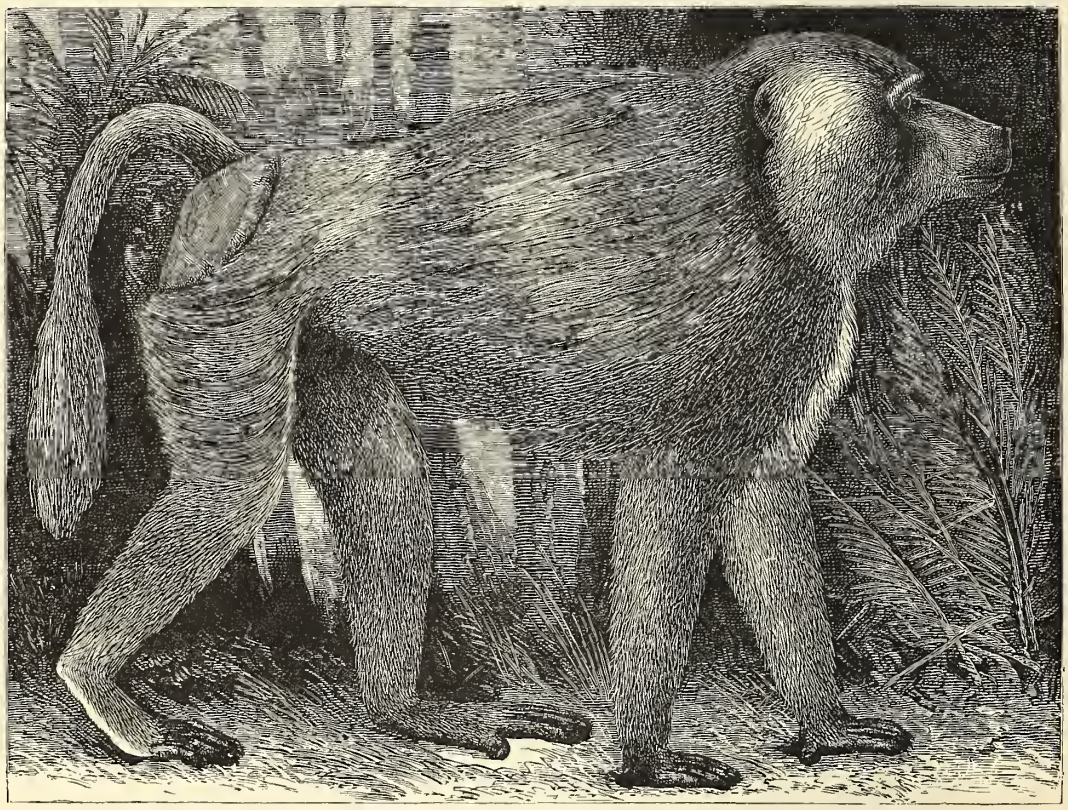
"The main body is composed of females, inexperienced males, and the young of the tribe. Those of the females who have small children carry them on their back. Unlike the dignified march of the leaders, the rabble go along in a most disorderly manner, trotting on and chattering without taking the least heed of anything, apparently confiding in the vigilance of their scouts. Here a few of the youth linger behind to pick the berries off some tree, but not for long, for the rear-guard coming up forces them to regain their places. Then a matron pauses for a moment to suckle her offspring, and not to lose time dresses its hair whilst it is taking its meal. Another younger lady, probably excited by jealousy, or by some sneering look or word, pulls an ugly mouth at her neighbour, and then, uttering a shrill squeal highly expressive of rage, vindictively snatches at her rival's leg or tail with her hand, and gives her, perhaps, a sharp bite in the hind-quarters. This provokes a retort, and a most unladylike quarrel ensues, till a loud bark of command from one of the chiefs calls them to order. A single cry of alarm makes them all halt and remain on the *qui vive* till another bark in a different tone reassures them, and they then proceed on their march.

"Arrived at the cornfields, the scouts take their position on the eminences all around, while the remainder of the tribe collect provision, with the utmost expedition, filling their cheek-pouches as full as they can hold, and then tucking the seeds of corn under their armpits. Now, unless there be a partition of the collected spoil, how do the scouts feed? for I have watched them several times, and never observed them quit for a moment their post of duty till it was time for the tribe to return, or till some indication of danger induced them to take to flight. They show also the same sagacity in searching for water, discovering at once the places where it is most readily found in the sand, and then digging for it with their hands just as men would, relieving one another in the work, if the quantity of sand to be removed be considerable. Their dwellings are usually chosen in clefts of rocks, and are always placed so high that they are inaccessible to most other animals, and sufficiently sheltered from the rain. The Leopard is their worst enemy, for being nearly as good a climber as they, he sometimes attacks them, and then there is a tremendous uproar. I remember one night, when outlying on the frontier, being disturbed in my sleep by the most awful noises I ever heard, at least they appeared as such, exaggerated by my dreams. I started up thinking it was an attack of negroes, but soon recognised the voices of my Baboon friends from the mountain above. On my return home I related the fact to the natives, who told me that a Leopard was probably the cause of all this panic. I am not aware how he succeeds amongst them. The people say that he sometimes manages to steal a young one and make off, but that he seldom ventures to attack a full-grown Ape. He would doubtless find such an one an awkward customer; for the Ape's great strength and activity, and the powerful canine teeth with which he is furnished, would render him a formidable enemy, were he, from desperation, forced to stand and defend his life. It is most fortunate that their courage is only sufficiently great to induce them to act on the defensive. This indeed they only do against a man when driven to it by fear, otherwise they generally prefer prudence to valour. Had their combativeness been proportioned to their physical powers, coming as they do in hordes of two or three hundred, it would have been impossible for the natives to go out of the village, except in parties, armed, and instead of little boys, regiments of armed men would be required to guard the cornfields."

A traveller, relating his experience with these Baboons, writes as follows :—

"The first band I saw was just resting after their morning ramble. I had seen the tall forms of the males from some distance, but had taken them for rocks, as these Apes resemble them when they are still. I was first undeceived by a repeated cry, which sounded like a shrill cry of 'Kuck.' All heads were turned our way, and only the young ones went on with their games. Probably the whole herd would have stopped in this attitude had not we had two Dogs with us that we kept to keep off hyenas from the house. These answered the cries of the Apes, and we immediately noticed a commotion among the herd. They started off and disappeared. Much to our astonishment, at the next bend of the road, we saw the whole band in a long row clinging on to what seemed a perpendicular

rock. This was too much for us, and we determined to have a shot at them. Unfortunately, the rock was too high for a sure aim. Anyhow, we hoped to disturb them. The first shot had a wonderful effect. A tremendous barking and shrieking was the answer. Then the whole band moved on, climbing over the rocks in a most astonishing manner, where it seemed almost impossible to find a footing. We fired about six shots, though it was impossible to be sure of hitting. It was most comical to see the whole band, at every shot, cling on to the rock as if they thought the earth would give way under them. The next turn we found them no longer on high ground, but in a valley where they were going through to get to the hills beyond. Part of the band had crossed, but most were still behind. Our Dogs stopped a minute, and then rushed in among the herd. So soon as they got there all the old males rushed from the rocks, formed a circle round the Dogs, and opened their



THE SACRED BABOON.

mouths, beat the earth, and looked so fierce, that the Dogs retreated with all speed. Of course, we encouraged them to return to the fight, and in the meanwhile the Apes had got across the valley. As the Dogs returned to the attack there were only a few in the valley, and among them a young one of about six months old. As it saw the Dogs it cried out, and fled to the rocks, where our Dogs brought it to bay, and we flattered ourselves that we should catch it. Proudly and quietly, without troubling himself about us, came an old male back from the other side, walked fearlessly between the Dogs, climbed slowly up the rock, and took off the young one in triumph."

Their regard for their mutual safety is even seen in captivity, for it has happened that when a Baboon, who has been extremely savage, unbearable, and mischievous in his compartment, had to be chained to be punished, the others tried to protect him.

"Many kinds of Monkeys," writes Mr. Darwin, "have a strong taste for tea, coffee, and spirituous liquors; they will also, as I have myself seen, smoke tobacco with pleasure." The wild Baboons of North-eastern Africa are often caught in consequence of their naughty propensity and love of a "drop." The natives fill some vessels with strong beer, and put them out in places where they

look particularly tempting to the thirsty. The Baboons, ever on the watch for something new and to steal, see the pitchers and pans, and of course just taste their contents. Feeling happy and enlivened, after a while they try again, and finally drink long and deeply, becoming in a short time decidedly tipsy, and unable to take care of themselves. Drunk and incapable would be the accusation against them by native police. Unfortunately for the tipplers their punishment is greater than the crime; and not only do they suffer all the miseries of headache, thirst, and bodily depression, but they lose their liberty also, and not for a time only. The natives, knowing that after a few hours they may expect to find the Baboons incapable of biting, fighting, or running away, go out and search for their victims, and bring them home and place them in durance vile. The next morning they awake to a sense of their condition. They hold their aching heads with both hands, and look with a most pitiable

YOUNG HAMADRYAS. (*From the Zoological Gardens.*)

expression. Brehm saw some of them in this plight, and gives a most amusing description of their grimaces and laughable conduct. A little wine or beer was offered to some who had recovered from their debauch, but they would have nothing to do with it at the time. They turned away with disgust, but they relished the juice of some lemons which was given to them.

The Baboons, symbolical of learning, the observers of the moon in eclipse, and the companions of the bacchanalian jug, once so esteemed, worshipped, and mummified by the ancient Egyptians, have terribly fallen in social and religious reputation on the very spot of their former glories. In modern Egypt they may be seen in some houses where, at a fanciful kind of banquet, they have to sit around the room holding torches. And right bad torch-bearers they are, for every now and then some Baboon becomes aggressive, or some guest has a nice piece on his plate for which the Baboon longs, and the consequences are a departure of the light from its perpendicular, a slight motion amongst the row of curious candelabra, and oftentimes such disorder as can only be remedied by the timely application of the discipline of the stick. They are carried about to do tricks, and brutalised in every way.

Mansfield Parkyns asserts that the cleverness of these Baboons depends in some measure upon their power of reason, and not entirely on that instinct with which all animals are endowed, and which serves them only to procure the necessaries of life and to defend themselves against their enemies. In proof he relates an anecdote, of which he was an eye-witness. "At Khartûm, the capital of the provinces of Upper Nubia, I saw a man showing a large male and two females of this breed, who performed several clever tricks at his command. I entered into conversation with him as to their sagacity, the mode of teaching them, and various other topics relating to them. Speaking of his male Monkey, he said that he was the most dexterous thief imaginable, and that every time he was exhibited he

A VILLAGE IN NUBIA.

stole dates and other provisions sufficient for his food for the day. In proof of this he begged me to watch him for a few minutes. I did so, and presently the keeper led him to a spot where a date-seller was sitting on the ground with his basket beside him. Here his master put him through his evolutions, and although I could perceive that the Monkey had an eye to the fruit, yet so completely did he disguise his intentions, that no careless observer would have noticed it. He did not at first appear to care about approaching the basket, but gradually brought himself nearer and nearer, till at last he got quite close to the owner. In the middle of one of his feats he suddenly started up from the ground on which he was lying stretched out like a corpse, and uttering a cry as if in pain or rage, fixed his eyes full on the face of the date-seller, and then, without moving the rest of his body, stole as many dates as he could hold in one of his hind hands. The date man, being stared out of countenance, and his attention diverted by this extraordinary movement, knew nothing about the theft till a bystander told him of it, and then he joined heartily in the laugh that was raised against him. The Monkey having

very adroitly popped the fruit into his cheek-pouches, had moved off a few yards, when a boy in the crowd round him pulled him sharply by the tail. Conscience-stricken, he fancied that it had been done in revenge by the date-seller whom he had robbed; and so, passing close by the true offender and behind the legs of two or three others, he fell on the unfortunate fruiterer, and would no doubt have bitten him severely, but for the interference of his master, who came to the rescue."

Although so clever, the Hamadryas is much more deficient in brain than the higher Apes, the Orang for instance. It is not so much developed in front, and the whole mass is not so high, but still it projects well over the little brain, or cerebellum. The convolutions are simpler, and although all the principal markings noticed even in man are present, still the smaller ones, and those which belong to structures which add to the superficial extent of the organ, are wanting. The ventricles and the posterior horn and its eminences are present, as is also that particularly monkey development, the fissure, which is called the external perpendicular.

Evidently the compressed form of the skull, which seems as if it had been pressed far above over the forehead, has much to do with the small bulk of the front of the brain, and this is also diminished by the projection of the orbits into the brain case. The skull is certainly an ugly thing to look at, and is only surpassed by that of the full-grown Mandrill in want of elegance, of outline, and smooth configuration. The forehead and top of the skull are broad and flat, and the whole brain case appears to slope off at the sides of the orbits, and then projects but little there, the broadest part of the skull being at the cheek-bone. The orbits are oblique, that is to say, they look forwards and outwards, and they are tolerably widely open. There is a great roundness and swelling of the upper jaw-bone from the cheek-bone to the long nasal bones, and the front jaw-bone (the pre-maxillary) is short and projecting. The shape of the skull resembles that of the Sphinx Baboon.

Their name, given to them by the naturalist, is as great a puzzle as are many others devoted to animals, for what possible connection can there be between the Hamadryads, the nymphs whose birth, life, and death were mysteriously united with the corresponding epochs in the growth of the oak-tree, and a most un-nymphlike creature which likes rocks, holes, and dens, but who neither cares for oaks nor acorns?

THE GELADA BABOON.*

These Baboons are quite as clever as the great Dog-faced kind, which has been immortalised by the ancient Egyptians, and every now and then troops of both come in contact and have great fights. The Gelada Baboon, with its long tail tufted at the end, and black limbs, has very long hair on its upper parts of a pale brown colour. This covers the head where there is a dark line from the forehead backwards, and also the shoulders and rump. This Baboon, moreover, has the nostrils opening high up in the face, and not close to the end of the upper jaw, as in the Hamadryas. Differing thus from the Hamadryas Baboons, each troop soon knows its comrades. Occasionally, when the fields are ripe with grain, the Geladas, perched upon their mountain homes, see the glowing and varied colours of the vegetation, and long for the luxuries of the plains. They descend and sometimes rob the farmers with impunity, and return after having committed a vast amount of mischief. But it happens that the great Dog-faced troops are out on the same errand, and the two sets of thieves speedily disagree. A fight ensues, and the Geladas roll down great stones, which the others try to avoid, and then they all rush together to close quarters, making a great uproar, and fighting with great fury. Some of these gallant Geladas had the audacity to stop a Serene Highness in his travels in Abyssinia, and very effectually, for some hours. A Duke of Coburg-Gotha was in a caravan which had to traverse the pass of Meusa, in Abyssinia, and as there were some of the Baboons perched in numbers on the sides of the high rocky ravine, some of the Europeans, who of course must try and kill something as often as possible, fired upon them. The Baboons retaliated in a most military manner, by rolling down stones in such quantity and of such a size that not only had the firing party to retire, but the passage of the caravan was stopped. They positively closed the pass against all comers for some time.

Darwin tells a laughable anecdote of a Baboon, but does not mention the kind. He saw in the Zoological Gardens a Baboon who always got in a furious rage when his keeper took out a letter or

* *Cynocephalus Gelada.*

book and read it aloud to him; and his rage was so violent that, as Mr. Darwin witnessed, on one occasion he bit his own leg till the blood flowed.

THE PIG-TAILED BABOON, OR CHACMA.*

The Hottentots are familiar with one of the largest kinds of the Baboons, which reaches the size of an English Mastiff, and has superior strength, and they call it the Tchackamma, which has been reduced by Europeans to the "Chaema." The colonists of the Cape of Good Hope districts called it the Black Ape, and then, from some fanciful resemblance of its tail to that of a Pig, the creature was dignified with the name Porcarius.

The Chaemas are found in great troops, and they behave very much after the manner of the other large Baboons, their strength rendering them a terror to the Dogs of the colonists. In ascending the kloofs, or passes, in the mountains of South Africa, which are frequently steep, narrow, and dangerous, travellers often disturb great troops of these animals, which have been sunning themselves on the rocks. If not attacked they scamper up the sides of the mountains yelling and screaming. They resent being fired upon, after the usual manner, by rolling down stones.

The Chacma has a fine black tail, which is rather more than half the length of the body, and it has a tuft of long black hair at its tip. It is carried like that of the other long-tailed Baboons, being curved upwards at first, and then falling down straight. Nearly all the fur of the body is a uniform dark brown, almost black, mixed throughout with a dark green shade. It is long and shaggy, particularly on the neck and shoulders of the males. If a solitary hair be pulled out, it will be found to be very curiously ornamented. It has a root, like all hairs, springing from a little pimple under the scarf-skin, and its colour is at first of a light grey colour. Then it is marked with wide rings of colour, which are perfectly distinct, and they are alternately black and dark green, but sometimes they are intermixed with a few of a lighter or yellowish shade. The face and ears are naked, as are also the palms and soles, and there are small whiskers, grey in colour and brushed backwards. Naked as are the face, ears, and hands, the skin is of a very dark violet-blue colour, with a pale ring surrounding each eye. Strange to say, the upper eyelids are white.

In the adult the muzzle is very long in comparison with the skull, which is greatly flattened and contracted; but in the young, the size of the nose is not so apparent, and the head is rounder, and the brain case is larger in proportion. As age comes on, the brain is not increased in size correspondingly with the face.

There is no doubt that the old Baboons have a very fine sense of smelling, their noses are large, and the sentient surface is great; moreover, this gift has been tested and used to the advantage of many a wanderer and settler in the districts where water is scarce at the surface, but plentiful here and there, resting on rocks which are covered with sand or soil. The Baboon can find out water when even the Bushmen are quite at fault, and when other animals are dying of thirst. When a manageable Baboon is at hand, and people are in a dreary district searching for water, they lead him in the required direction suffering from thirst, and give him his liberty. He moves over the ground quickly, smelling here and there, or gallops with extended nostrils, now turning in one direction and now in another, quartering out his ground like a Dog. Sooner or later he stops and begins to dig with his hands, and then the people come up, and water is almost always found, and in quantity.

Although the young Chaemas are playful enough, and are full of nonsense and fun in captivity, they, like all their kindred Baboons, become surly, ferocious, and unsafe as they grow old and have their bodies perfectly developed to the perfection of baboonism. That is to say, when the face, jaws, and teeth become as large as they ever will be, and the body becomes as short and as muscular as possible. They then scowl at the visitor, and grind and show their great teeth at the slightest provocation, grumbling and growling also, and in fact, to quote the words of a very precise naturalist, "the fierceness and brutality of their character and manners correspond with the expression of their physiognomy." Nevertheless, they are amenable to soft influences. In spite of their savage and untamable disposition, they are influenced by that most potent of all attractions. They are, in the language of the writer just quoted, "agitated by the passion of love or jealousy. In captivity they

* *Cynocephalus porcarius.*

are thrown into the greatest agitation at the appearance of young females." Not females of the Baboon tribe, but those who, under all circumstances, are now called ladies. "It is a common practice," continues the writer, "among itinerant showmen, to excite the natural jealousy of these Baboons by caressing or offering to kiss the young females who resort to their exhibitions, and the sight never fails to excite in these animals a degree of rage bordering on phrensy. On one occasion, a large Baboon of this species escaped from his place of confinement in the Jardin des Plantes at

THE PIG-TAILED BABOON.

Paris, and far from showing any disposition to return to his cage, severely wounded two or three of his keepers who attempted to recapture him. After many ineffectual attempts to induce him to return quietly, they at length hit upon a plan which was successful. There was a small grated window at the back part of the den, at which one of the keepers appeared, in company with the daughter of the superintendent, whom he appeared to kiss and caress within view of the animal. No sooner did the Baboon witness this familiarity, than he flew into the cage with the greatest fury, and endeavoured to unfasten the grating of the window which separated him from the object of his jealousy. Whilst employed in this vain attempt, the keepers took the opportunity of fastening the door, and securing him once more in his place of confinement. Nor is this a solitary instance of the influence which women can exert over the passions of these savage animals. It is said that, generally un-

tractable and incorrigible whilst under the management of men, it usually happens that Baboons are most effectually tamed and led to even more than ordinary obedience in the hands of women, whose attentions they often repay with gratitude and affection."

There is another side to the picture, however, and probably about as true. "Travellers sometimes speak of the danger which women run who reside in the vicinity of the situation which these animals inhabit, and affirm that the negresses on the coast of Guinea are occasionally kidnapped by the Baboons; we are even assured that certain of those women have lived among the Baboons for many years, and that they were prevented from escaping by being shut up in caves in the mountains, where, however, they were plentifully fed, and in other respects treated with great kindness! It is to be observed, however," writes this author, "that these accounts rest upon authority which is by no means unexceptionable; credible and well-informed modern travellers do not relate them, and even their older and more credulous predecessors give them only from hearsay."

There is a curious connection between the growth of the hair on some parts of Monkeys and their combative habits. Thus these Baboons have a long mane, and that of the male is, of course, the longest; and these are perhaps the only Apes which seize each other by the nape of the neck with their long canine teeth, the males being the fighters. The mane, then, is clearly of advantage. On one occasion this propensity displayed itself on one of the higher animals who was not thus protected, in an attack by a Baboon on one of the keepers at the Zoological Gardens, the keeper unfortunately having no clothes on the back of his neck to act as a mane. The man was stooping down, when the Baboon suddenly pounced on him, and bit him most severely and dangerously in this exposed spot. During this savage and unexpected attack, the affectionate impulses of a little Monkey were of great use and service, for, seeing its keeper in danger, it bit the brute, and screamed in such a manner as to distract its attention, and to allow the man to escape.

All the Chacmas, however, are not furiously jealous, or fighters, or kidnappers of women, for many have excellent memories of kindnesses, and do not fail to express their gratitude. Thus Sir Andrew Smith was recognised by a Baboon at the Cape of Good Hope, with much evidence of satisfaction, after he had been absent for nine months. The females are also often very tender and affectionate. One of them, an old female, adopted a little Rhesus Monkey, and took all sorts of care of it; but when a young Drill and Mandrill were placed in the cage she seemed to perceive that those Monkeys, though distinct species, were her nearer relations, for she at once rejected the Rhesus, and adopted both of them. The young Rhesus was greatly discontented at being thus rejected, and it would, like a naughty child, annoy and attack the young Drill and Mandrill wherever it could do so safely; this conduct exciting great indignation in the old Baboon. Another female Baboon had so capacious a heart that she not only adopted young Monkeys of other species, but stole young Dogs and Cats, which she continually carried about. Her kindness, however, did not go so far as to share her food with her adopted offspring. An adopted kitten scratched this affectionate and selfish old thing, who certainly had a fine intellect, for she was much astonished at being scratched, and immediately examined the kitten's feet, and without more ado bit off the claws!

Le Vaillant in his African travels was accompanied by a Monkey, which was probably one of these Chacmas. It lived on very good terms with cocks and hens, thus disproving the antipathy which tradition has handed down as existing between these very different creatures. He was amused at the one, and stole the eggs of the other. In fact, he not only tasted the eggs of his own accord, but was made to taste all sorts of fowls and nuts for the benefit of the travellers, who feared being poisoned. If this creature, which was called "Kees," refused them, they were left untouched by those who had a very sensible opinion of his instinct. Besides being taster he was watch-dog. "By his cries," writes the traveller, "and other expressions of fear, we were always informed of the approach of an enemy before my Dogs could discover it. They were so accustomed to his voice, that they slept in perfect security, and never went the rounds, on which account I was very angry, fearing that I should no longer find that indispensable assistance which I had a right to expect if any disorder or fatal accident should deprive me of my faithful guardians. However, when he had once given the alarm, they all stopped to watch the signal, and on the least motion of his eyes, or the shaking of his head, I have seen them all rush forward, and run far away in the quarter to which they observed his looks directed. I often carried him along with me in my hunting excursions, during which he would amuse himself climbing

up the trees in order to search for game, of which he was remarkably fond. Sometimes he discovered honey in the crevices of rocks, or in hollow trees, but when he found nothing, when fatigue and exercise had whetted his appetite, and when he began to be seriously oppressed with hunger, a scene took place which appeared to me exceedingly comic. When he could not find game or honey, he searched for roots, and ate them with relish, especially one of a particular species, which, unfortunately for me, I found excellent and very refreshing, and which I wanted greatly to partake of. But Kees was very cunning. When he found any of this root, if I was not near him to claim my part, he made great haste to devour it, having his eyes directed all the time towards me. By the distance I had to go before I could approach him he judged of the time that he had to eat it alone, and I indeed arrived too late. Sometimes, however, when he was deceived in his calculation, and when I came upon him sooner than he expected, he instantly endeavoured to conceal the morsels from me; but by means of a blow well applied I compelled him to restore the theft; and in my turn becoming master of the envied prey, he was obliged to receive laws from the offended party. Kees entertained no rancour or hatred, and I easily made him comprehend how detestable was that base selfishness of which he had set me an example. To tear up these roots Kees employed an ingenious method, which afforded me much amusement. He laid hold of the tuft of leaves with his teeth, and pressing his four paws firmly against the earth, and drawing his head backwards, the root generally followed. When this method did not succeed, he seized the tuft as before, as close to the earth as he could, then throwing his heels over his head, the root always yielded to the jerk he gave it. In our marches, when he found himself tired, he got upon the back of one of my Dogs, which had the complaisance to carry him for whole hours together. One only, which was larger and stronger than the rest, ought to have served him for this purpose; but the cunning animal well knew how to avoid this drudgery. The moment he perceived Kees on his shoulders, he remained motionless, and suffered the caravan to pass on, without ever stirring from the spot. The timorous Kees still persisted; but as soon as he began to lose sight of us he was obliged to dismount, and both he and the Dog ran with all their might to overtake us. For fear of being surprised, the Dog dexterously suffered him to get before him, and watched him with great attention. In short, he had acquired an ascendancy over my whole pack, for which he was perhaps indebted to the superiority of his instinct; for among animals, as among men, address often gets the better of strength. While at his meals Kees could not endure guests; if any of the Dogs approached too near him at that time, he gave them a hearty blow, which these poltroons never returned, but scampered away as fast as they could. It appeared to me extremely singular, and I could not account for it, that next to the Serpent, the animal which he most dreaded was one of his own species; whether it was that he was sensible that his being tamed had deprived him of great part of his faculties, and that fear had got possession of his senses, or that he was jealous and dreaded a rivalry in my friendship. Sometimes he heard others of the same species making a noise in the mountains; and notwithstanding his terror, he thought proper, I know not for what reason, to reply to them. When they heard his voice they approached; but as soon as he perceived any of them he fled with horrible cries; and running between our legs, implored the protection of everybody, while his limbs quivered through fear. We found it no easy matter to calm him; but he gradually resumed after some time his natural tranquillity. He was very much addicted to thieving, a fault common to almost all domestic animals; but in Kees it became a talent, the ingenious efforts of which I admired, and notwithstanding all the correction bestowed on him by my people who took the matter seriously, he was never amended. He knew perfectly well how to untie the ropes of a basket to take provisions from it; and, above all, milk, of which he was remarkably fond; more than once he has made me go without any. I often beat him pretty severely myself; but when he escaped from me, he did not appear at my tent till towards night." "Milk in baskets!" why truly the term "basket," as applied to a vessel for holding milk, appears to require some explanation; but it was really carried in baskets woven by the

SKULL OF THE CHACMA.

Yonaquas, of reeds so delicate and so close in texture that they might be employed in carrying water or any liquid. The abstraction of the milk may be considered as a kind of set-off against the appropriation of Kees's favourite root by his master. The pertinacious way in which Kees bestrode Le Vaillant's Dogs will recall to the remembrance of some a Monkey that was, and perhaps still is, riding about London in hat and feather, with garments to match, upon a great Dog, with the usual accompaniment of hand-organ and Pan's pipe. Upon these occasions the Monkey evidently feels proud of his commanding position; but ever and anon we have seen him suffer from one of those sad reverses of fortune to which the greatest among us are subject. In the midst of the performance, while the organ and pipe are playing, and the Monkey has it all his own way, and elevated with the grandeur that surrounds him, is looking in a supercilious manner at the admiring crowd, some good-natured but unlucky boy throws the Dog a bit of cake, in his zeal to pick up which the latter lowers his head and shoulders so suddenly as infallibly to pitch his rider over his head. We have thought more than once that there was a sly look about the Dog as he regarded the unseated Monkey, utterly confounded by his downfall, and the accompanying shouts of laughter from the bystanders.

The Pig-tailed Baboon being very clever, very agile, and able to use his jaws admirably in digging, eating, and fighting, should have a good skull, and certainly that of an adult, although useful is extremely ugly. The brain case is even for a Baboon small in comparison with the rest of the skull, and it is hidden in front by the large prominences over the orbits; it swells out behind, and is marked by a side crest, which passes backwards to meet that of the other side from above each ear. The orbits are separated by a straight (vertical) ridge of bone, which gives a curious look to the face, and makes the eyes look straight to the front along the swollen nose. The openings for the nostrils in the skull (anterior nares) are large and rather oval, and the upper jaw is as it were nipped in above the grinders, and then swollen out above. The long nose bones (nasals) are separated by a slight depression from the great ridges of the upper jaw. The huge upper canine teeth are most extraordinary. They are slim, slightly curved, long ($1\frac{1}{2}$ inches), and sharp at the tip; when examined they are almost rapier-shaped or triangular in outline, the front of the triangle is grooved, and the back is a sharp cutting edge. The groove is for the top of the lower canine which works into it, and the sharp edge behind cuts upon the tooth in the lower jaw behind the lower canine (the first pre-molar), pushing it backwards and displacing it. These fangs are very terrible to look at, and yet it appears that their principal work is done with the back edge of the upper one grinding and cutting on the curiously-started tooth of the lower jaw. They are capital holders, root-cutters, and nut-crackers.

THE SPHINX BABOON.*

There is nothing much more amusing than to see a young Sphinx Baboon just a little irritated by some one who knows him. They are fine large creatures even when young, and have then an amiable expression of countenance, which they lose with the cares of old age. Greatly resembling the young of the Chacma, they have much the same disposition for play, and can be made a little jealous and fierce. Their colour differs, for their black face is encircled by a dark hair with a decided greenish tint, which is very universal, and upon this they appear to be arranged as different in kind. One in the Zoological Gardens is exceedingly active, running on all-fours well, and climbing up the wires of his cage to catch a look at his neighbours. He will come to the side, and on being asked whether he will have a scratch turns round and places his back at the disposal of the scratcher, whose operations he much enjoys; moreover, he puts out his hands and feet for examination, and is very quiet. But he has a trick which is not only very curious but instructive, as it explains how these Baboons can throw stones, and with good aim. Somebody who knew him came to see him with a lady and offered him a greengage, and when he was about to take it, pretended to give it to her. This excited the indignation of the Sphinx, who trotted off to the further end of his cage and seized a tin pot, which sometimes contains food or water. Taking it in both hands he ran towards the lady and threw it forcibly, and in a good line, at her. He followed his pot, and as it came back by

* *Cynocephalus Sphinx.*

rebounding from the wires he escaped it by straddling his legs. Then he came to the side and scolded much, and looked much put out. He soon forgave the injury, and submitted to having his back scratched with pleasure. Then the greengage was offered again, and before he could take it the fruit was presented to a Baboon in the next compartment. This led to the same result—a rush off to the end of the cage, a rummage for the pot, and a very good throw with both the hands. At length, when he had the fruit given to him he was perfectly content. His looks at the lady were certainly cross and angry enough. Evidently there is a good power of aiming, and as the object is thrown as the Baboon is moving it receives a considerable impetus.

The Sphinx Baboon, or Cynocephalus Sphinx, inhabits Guinea, and is commonly seen in menageries, and stuffed in museums. As old age comes on its character alters as well as its aspect of countenance; it ceases to be familiar and becomes morose and ferocious. The skull of the Sphinx Baboon resembles, to a certain degree, that of the Hamadryas Baboon, but the orbits are decidedly oblique. There is the same filling up of the upper jaw-bones, and the cheek-bones do not project very much.

THE ANUBIS BABOON.*

These Baboons live a very peculiar life in the neighbourhood of Angola, a Portuguese settlement on the western coast of Africa. Instead of delighting in the dense woods and glades of the tropical country close by, where fruit, nuts, and roots exist in vast abundance, and where water is most plentiful, they prefer to inhabit a hilly district which is much cut up in all directions by deep dry gullies, and grand rocky ravines. The country is badly supplied with vegetation, and water is very scarce. There are a few prickly shrubs, a few roots of grass, and certain kinds of thick club-stemmed dwarf shrubs all bearing a few leaves, only during the few months of the year in which rain falls. During the rest of the year nothing is seen but bare rock and scorched leafless firewood. At distances far apart, water only exists in deep dry gullies under the sand. In the neighbourhood of the rivers on that part of the coast vegetation is most luxuriant, but the Monkeys prefer the arid country, living principally on the root and stem of one of the most extraordinary plants in the world—the Welwitschia.

SKULL OF THE ANUBIS BABOON.

The dog-like jaws of these Apes are very useful in gnawing the exposed roots of these plants, and they manage to nibble them just as a Sheep does a turnip. When thirsty they seek for water, and in company with Zebras and other animals excavate or scrape holes in the sand until it is found over the hard sub-rock.

They are very wary, and usually assemble in troops of fifteen or more, and when they move about they send forward one or two who act as scouts, and give signals to the main body about what is going on in front. Some time since a man opened a well at some copper-mines on the hills, and he soon found that the Baboons knew what he had done, for they came down to drink in bodies of thirty or forty.

They run very fast and on all-fours in a kind of sideway gallop, and the little ones ride on the backs of their dams, holding very tight and safely. It appears that there is some discipline going on amongst them when they are in bodies, for if a scout should happen not to signal danger or whatever is interesting to the whole band, the rest set upon him, and give him a good thrashing.

Some similar or perhaps the same kind of Baboon lives a more pleasant life than these in another district in the neighbourhood of Angola. These are some most extraordinary rocks which are situated some two hundred or more miles in the interior, and were mentioned more than two centuries ago in the books of missionaries and other travellers as great wonders of nature. They are the Black Rocks of Pungo Andongo. These rocks, rising on the outskirts of a district celebrated for

* *Cynocephalus Anubis.*

its marvellous fertility and richness of vegetation, are arid looking on the top, and dark, partly from the natural tint of the stone which is composed of gneiss. They encircle a valley, and extend over about ten square miles, being rugged, or in the form of gigantic pillars. Sloping away from the valley region with its great forests, they present precipitous sides towards it, and are broken up by ravines.

At first sight the stone of the precipices appears to be sterile or poor in vegetation, but the nearer the margin of the high land is approached the more luxuriant it becomes, the more flowery the open fields, and the more numerous the crystal brooks. Cultivation goes on here, and grain is carefully sown, maize especially. In other parts of the valley a dense dark-green primeval forest reaches close to the precipitous and partly sterile walls of rock. The upper part of the precipices and rocks are, however, bare of any shrub or tree-like vegetation, and look arid enough during the greater part of the year. Now all this is of great importance to the Baboon. He lives on the top of the rocks in hollows and under ledges of stone, and safely placed there in inaccessible places, he surveys the fertile scene below him, and selects the choicest of the fields for the supply of his food. Probably there would be no such oasis in the country were it not for a very curious plant which really gives the name to the "Black Rocks," and which clothes the hills during the wet season. And if there were no fertile valley the Baboon would certainly not be found in this district. As the wet season progresses, the hills look blacker and blacker, their ruggedness disappears, and even the sterile faces of the precipices grow dark, and the vegetation of the valley appears to crowd up their slope. All this alteration is produced by the vigorous and indeed enormous growth of a singular plant called Scytonema. It retains much moisture within its tangles, and long after the rains have ceased to be felt and to influence the vegetation of the valley, the aridity of the district is antagonised or put off for a while by this interesting property. The Scytonema selects the bare rocks for its favourite locality, and these surround the valley with its teeming vegetation as with a great sponge, whose moisture prolongs the weeks of plant life and of active growth, and adds to a wonderful fertility. With plenty of running water, abundance of food, and a very safe shelter, the Baboons have great cause to thank the Scytonema. They flourish amongst the rocks, and are a terrible scourge to the inhabitants of the valley. Their cunning and boldness are remarkable, and are increased by their numbers. After surveying the growth of the choicest fields of Indian corn they assemble in great troups and destroy entire plantations in a single night.

THE COMMON BABOON.*

There is a Baboon which is much more commonly seen in menageries on the Continent than any other, and which is kept by the Arabian and Egyptian jugglers; yet it is by no means satisfactorily made out whether it is a particular species or only the young or even adult form of some one of those already described. It has a name, however, which ought to leave the identity of the creature in no doubt—it is the Common Baboon, or *Cynocephalus Papio*. If it really comes from all the places whence it is said to be derived it lives over a vast district, and is to be found on the west or Guinea Coast inland, and also in Abyssinia, and on the Nile further north. Dr. Kirk found them in Zambesia in Eastern Equatorial Africa, and was told that the natives held them as sacred, and preserved them, calling them "Nyam" and "Manganja." But probably the specimens from Guinea are those of the Sphinx Baboon, those from Abyssinia are the females of the Hamadryas or of Geladas, and possibly there may be some in this district which really are true Papio Baboons.

They are very common in the half wild and tame condition; and as they often have to take care of themselves in the midst of a very restless and half-starving set of men, their senses become sharpened, and their intelligence becomes exalted in a most curious manner. But nothing is known of them in the wild state.

They are large animals, and their hair is of a uniform yellowish-brown colour, slightly shaded with sandy or light red tints. The whiskers are of a light fawn colour, and the face, ears, and hands are naked and black; the upper eyelids are white and naked, and the tail is about one-half the length

* *Cynocephalus Papio.*

of the body, but it has no tuft. They have no mane, and the muzzle is not so prolonged as in the Hamadryas and Chacma Baboons; nevertheless, the cheeks are rather swollen, and in this there is a faint resemblance to the Mandrill, but they are not coloured, and the muzzle is thin beyond them, and as it were truncated. The ears are visible, and are black and hairless, but are somewhat pointed. All the underneath of the body and the under part of the limbs are covered with hairs of a brown colour. Some are of a greenish hue, and the hairs are not of one colour.

Buffon had one that was full grown, and it was as savage as well could be. It exhibited all the ferocity of disposition and intractability of nature common to the rest of its kind when full grown. "It was not," says he, "altogether hideous, and yet it excited horror. It appeared to be continually in a state of savage ferocity, grinding its teeth, perpetually restless, agitated by unprovoked fury. It was obliged to be shut up in an iron cage, of which it shook the bars so powerfully with its hands as to inspire the spectators with apprehension. It was a stout-built animal, whose nervous limbs and compressed form indicated great force and agility; and although the length and thickness of its shaggy coat made it appear to be much larger than it was in reality, it was nevertheless so strong and active that it might have readily resisted the attacks of several unarmed men."

But although thus ferocious in old age, they are amusing, tractable, teachable, and even affectionate when young; they know and like their master, are orderly when with him, can be taught all sorts of tricks, and they even like the young of other animals as pets. There are of course all sorts of stories told about them, some of which are true, for they were told by reliable naturalists from the results of their own experience, but the majority have too much of the wonderful in them, and are clearly the results of Eastern imaginations. A distinguished naturalist and traveller took much pains with some Baboons, and learned much of their habits and curious tricks, and his first pupil was amusing enough. Of course Baboons differ like higher animals in their temper and lightness of disposition; some are grumpy and stupid, and others are as friendly and frolicsome as a genially-disposed Dog. One of these last came into his hands, and was, for a Baboon, quite amiable looking, full of vivacity, and possessed of a vast amount of animal spirits and talent for the mischievous. He had a place set apart for him near one of the gates of the establishment in Egypt, where he acted as a sort of watch-dog. This duty he performed to perfection, and no one dared to attempt to enter without his leave. To those whom he knew he was polite, but to all others he was quite the reverse. Walking backwards and forwards in great ire when disturbed by anybody unknown to him, he finally stood stiffly on three of his legs, and hammered away at the floor with the knuckles of the other, just as a man raps a table when in a pet. His eyes glared, and he gave tongue in a fierce growling bark.

Sometimes he would put on a most enticing look, and seem most kindly disposed, seeking as it were the friendly notice of people; then out would come his hand for something nice to be given him, and if refused all his good looks departed, and he behaved more like a devil than a watch-dog, rushing at his enemy, and endeavouring to bite and scratch. He was on good terms with all the animals of the neighbourhood, but took a great dislike to some Ostriches which wandered about, and often came close to him, not apparently that they were necessarily unbeloved by Apes, but because they did him some very evil services most unintentionally. He liked to get on a wall under a quantity of straw, which protected him from the sun, and there he dozed away. Now the Ostrich has a very bad habit of trying to swallow or peck at everything; nothing comes amiss so that it can be swallowed; and they one and all are constantly poking here and poking there for most curious titbits. This was the case with the Ostriches in the Baboon's neighbourhood, and it now and then happened that as they were on the search for a novelty they noticed his fine stout tail hanging from the top of the wall. Of course the first Ostrich which was near gave it a good peck with his strong beak, and doubtless a good pull also. This was a most uncalled-for liberty, and not only woke up the sleeper, and hurt him, but also offended his dignity. He awoke full of rage, and before the Ostrich could give a second peck at the gristly morsel the furious Baboon rushed from under the straw, seized his enemy by the neck, and cuffed his head most soundly. He hated Ostriches ever after. The same Baboon was taken on board a boat with the travellers, and exhibited a great fear of the water. After a while he got a little accustomed to it, and gradually was tempted to touch it. He used to go the whole length of his cord, which kept him safe and sound, and, clinging on, would

just let one of his feet touch the glistening surface, and drag through the water. This trick he used to do when he was thirsty, for he sucked the water from off his foot.

He was very fond of young animals, and took upon himself the occupation of nurse, whether the mothers liked it, or the little ones cared for it or not. Thus, on once going through the streets of a town seated on the baggage-wagon, the Baboon was tied fast by a good long cord, which gave him much liberty. He saw by the side of the road a Dog with a litter of puppies, and immediately darted off, caught up one of them, and was returning before the mother had recovered from the shock produced by his audacity. She rushed after him as he retreated with the little puppy clasped to his bosom with one of his arms, and so vigorously did she pursue that the Baboon was placed in difficulty, and had to exercise all his resources to get out of her way with his charge. The wagon was on the

THE ANUBIS BABOON.

move, and the rope was at its fullest length, when he suddenly took hold of it with the spare hand, and running himself clear, and alighting on his hind legs, met the attack of the furious Dog most bravely. So stoutly did he persist, that the natives rather took his part, and he retained the little Dog. Afterwards his master took it from him, and restored it, to his great disgust; and, indeed, he was extremely offended, and was sulky and out of temper for long afterwards. Doubtless, if some intelligent men, who were accustomed to treat animals properly, would undertake the education of Baboons, they would be successful to a considerable degree; and there is no reason why they should not be as useful to man as the Dog. But they are teased and worried into a premature and senile savageness when in captivity.

One of the plans of teaching a Baboon to like his master is to keep him constantly in the house where he is; the master feeds him, and is kind and never teazing to him, giving him, however, friendly scratches on the back, and having romps with him. Then, when he will answer to some name or call, and has become familiarised with all around, some one comes in with a whip and begins to

talk loudly, and to order the Baboon out of the place. The creature is frightened, and is rather disposed to resist; whereupon the master makes his appearance, and pretends to take his part by opposing the intruder with violent gestures and threats, and making much of the poor brute. This has usually an excellent effect, and produces satisfactory results, the Baboon clinging henceforth to his friend. They are taught to help their masters in conjuring and juggling, and they do some tricks wonderfully well.

THE COMMON BABOON.

The skull of this Baboon has a face occupying about half of it, and the brain case is much contracted behind and at the sides of the brows, and is flattened behind and above, so that the top of the head and eyes looks pressed down. There is a ridge at the back of the skull extending from each ear-bone to a little knot at the back part of the occiput. All the back of the head is marked by the impression of the muscles of the back and neck, and the space for the jaw muscles is large on the side. Underneath, the skull is very long, there is the usual small space for the opening of the nostrils into the throat, and the palate is long and arched. In a specimen in the British Museum there is a little hook of bone on one of the small bones at the base of the skull (internal pterygoid bone), which is seen also in man, and it is for a tendon of a muscle to pass

around, the use of the muscle being to render the soft palate tense. Why this should be so well grown in this Baboon, whose voice is no better than others, is certainly strange. The face is made broad near the eyes by the projecting cheek-bones, and the orbits are broad, not widely open, and they are separated, as in some of the other Baboons, by a part of the forehead bone (frontal), and the upper part of the nose bones (nasals). The nostril opening is very triangular, and on either side is the broad smaller surface of the upper jaw-bone. The front bone of the upper jaw is very projecting. One is struck with the huge chin of the lower jaw, and how slanting and comparatively small are the jowl ends of it. Evidently from the great breadth of the back of the lower jaw, and its roughness for muscular attachments, it is a very strong one, the narrow part in front which holds the teeth being well moved up and down, and side to side, in biting and masticating.

Their hands are rather short, the fingers are black, and the third and fourth are of the same length: they are strong and hold well, the thumb being of no very great assistance, however.

CHAPTER IX.

THE DOG-SHAPED MONKEYS (*continued*)—6. THE BABOONS (2nd division).

The Second Division of the Baboons—THE MANDRILL—Easily Distinguished from the rest—Peculiar Appearance and Colour of the Face—The Cheek-ridges—Noticed by the Ancients—Brutality of its Disposition—"Jerry" at the Surrey Gardens—Their Wild State—Anatomical Peculiarities—The Back-bone and Liver—THE DRILL—Distinguished from the Mandrill—Probable Antiquity of these Baboons—Theories of their Relationship to other Animals—THE BLACK BABOON—Its Locality and Description—Probably a Forest Ape—General Summary of the Dog-shaped Quadrumana and Classification of the Group.

THE MANDRILL.*

THIS large Baboon is the principal one with a very short stump of a tail, and may be distinguished from all others, with and without long tails, by the enormous swellings of its cheeks on either side of its nose, and their odd colouring. In general shape it resembles the rest of the genus, but perhaps its head and chest may be more bulky, and its limbs shorter and stouter than the others, when it has attained its full growth. A full-grown male measures five feet when standing upright, and the colour of the hair is a light olive-brown above and silvery-grey beneath, and the chin is decorated with a small pointed yellow beard. It has a "brutus" in the form of a great tuft of hair on the top of the head, Nature having brushed up the hair off the temples and forehead upwards, in a peak-shaped ridge on the crown, giving a triangular appearance to the whole. The ears are naked and pointed near their tips, and their colour is bluish-black. The muzzle and the lips are large, and as it were swollen and projecting, and the former is not only long, but is surrounded above with an elevated rim or border, and cut short or truncated like that of a Hog. But the most extraordinary features of this ugliest of faces are the projections on either side of the nose. These are formed by swellings of the cheek-bones along the base of the great canine teeth, and the skin covering them is ribbed, and has ridges which are alternately light blue, scarlet, and deep purple in colour, contrasting strangely with the other tints of the hair. To add to the strange look, the eyes are deeply sunken, and their colour, a deep hazel, contrasts with a streak of vermilion, which reaches down either side of the nose to the lip, and extends upwards in the neighbourhood of the brows, which are large and "beetled." A forehead would clearly be out of place in such a brute, and therefore it recedes rapidly above the eyes, and is lost in the great tuft of hair.

The canine teeth are immense, and when the animal is enraged they and the others

* *Cynocephalus Mormon.*

are shown, their beautiful white colour contrasting with the strange medley of tints around them. On the body the hair is very bristly, but the hands and feet are naked, and as if to add to the many peculiarities of the Mandrill, they are small in relation to the vigorous-looking limbs and short chest.

So curiously decorated a brute living just outside the civilisation of the Egyptians, Greeks, and Romans, was sure to attract notice, especially as they were brought into Europe by the African merchants. Aristotle appears to have been struck with the hog-like look of the head, and he called it by the name of Hog-Ape (Chœropithecus), and all writers, from the earliest to the latest, have contributed opinions founded on very doubtful facts, to the detriment of its character. All the iniquities, abominations, and scandals that have been coupled with the Gorilla, Chimpanzee, and Orang-utan, are linked on fourfold to the character of the ill-favoured Mandrill, and this is decided to be quite correct by the natives of the Gold Coast and the inland regions, where it lives a most dreaded and independent life.

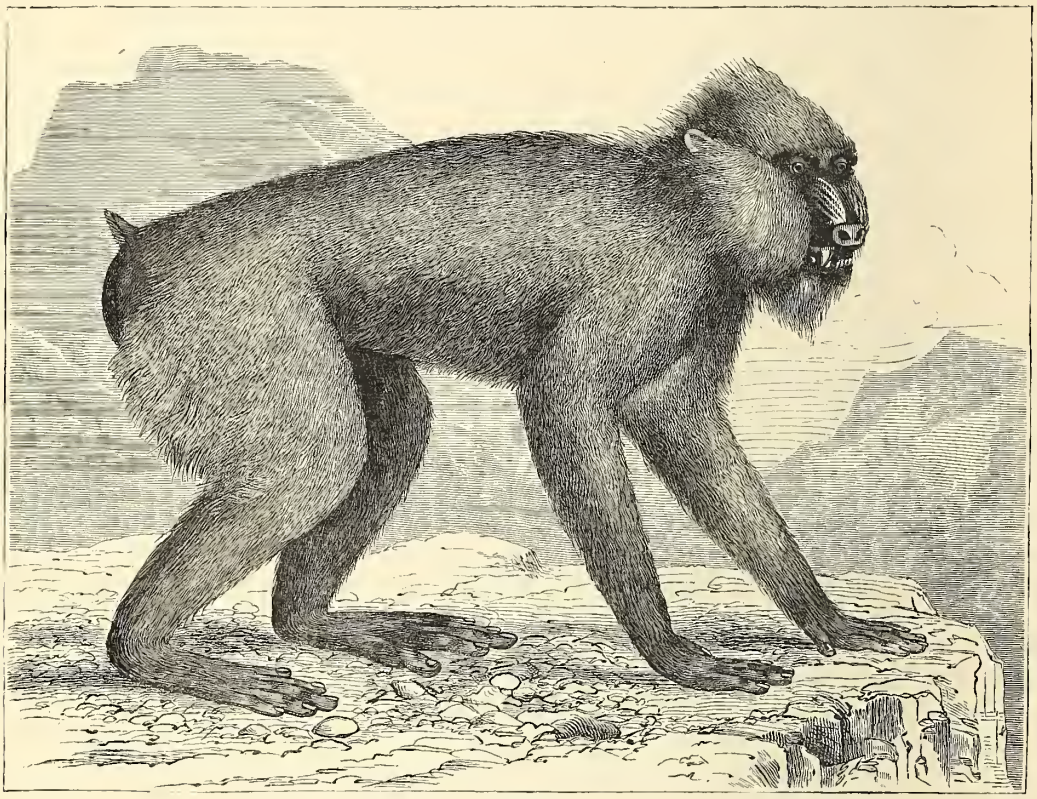
There is no doubt that the Mandrill is extremely brutal in its adult age, and that the males are ferocious and disgusting, there being no particular choice as regards ugliness and oddity of decoration between their faces and sterns, whose callosities are vast. But the young are not so, and probably the quieter tints of the female are associated with a gentler disposition. Both the young and the females have shorter muzzles than the adult males, and they have neither the great cheek-swellings nor the colouring of the face; in fact, it is only when the great eye teeth are being cut by the males, as evidences of its age and powers, that the irregular decoration begins to be noticed.

The question of the colouring and ornamentation of Monkeys will again be noticed in the summary at the close of the description of the Quadrumana, and it is therefore only now necessary to remark that the most grotesque-looking and ferocious Mandrill is especially beautiful in the eyes of his partner, who, with humble colours and softened looks, admires her fractious spouse. His colours glow with love and flame under the influence of passion, and probably no more curious-looking piece of living polychrome was ever seen than "Jerry," at the Surrey Zoological Gardens, when he got in a rage after drinking gin and water. "Jerry" was old and had gained all his ornaments, but had lost his levity, fur, and amiability. Brodrip writes about him: "He liked the good things of Mandrill life, but would not put up with its troubles. He was a glutton, and ferocious in the extreme. Most kindly he would receive your nuts, and at the same time, if possible, would scratch or pinch your fingers, and then snarl and grunt in senseless anger. He would sit in a little arm-chair, and would wrap himself up in a blanket, knowing what was coming, the bribe being either a cup of tea, which he took, as people used to say, 'quite like any Christian,' or, what was much nicer in his eyes, a glass of weak grog and a pipe. If he was disturbed in his enjoyment he was not pleasant, and if a shower of nuts came in upon his feast, especially if it occurred after the gin and water, he came out in his true colours. Cramming the nuts into his mouth, and stowing them away rapidly in his cheek-pouches, thus giving an unusual size to his jaws, he would howl and march about, snarling and grunting. His little eyes glared, his nose and cheeks became swollen, and their colours most vivid. His hair stood out, and he walked as it were on the very tips of his fingers and toes, presenting every now and then vermilion behind, which a distinguished French anatomist has said was not without elegance."

He was under the control of the keeper, who had, however, to take care that he was not bitten unawares, for "Jerry" was deceitful and treacherous in the extreme. It is said that he once dined in the presence of royalty, and that he was one of the many higher animals who were invited to dine by George the Fourth at Windsor when his Majesty required novel amusements and unusual excitement. Doubtless he behaved himself, and contributed as much, and probably more, than any guest, to the royal enjoyment, and he appears to have enjoyed his hashed venison himself. There was no mistake about his enjoying his pipe, for he smoked as slowly and sedately as the gravest of his visitors at the Zoological Gardens.

Had "Jerry" been let alone, and had he remained in Africa at liberty, doubtless he would have in time headed his troops as patriarch and watchman, and would have led them in many an expedition against the fields of corn and the plantations of fruit-trees. For the Mandrills, in a state of nature, behave much like the other Baboons. They are, however, very fond of insects, large and small,

inoffesive and venomous, and they lift up stone after stone in their search for them, enjoying Scorpions as much as anything else. Probably they can throw a stone, and this, coupled with their aspect, their assembling in troops to defy the farmers and watchers, and their attacking Dogs without mercy, has given them the bad character in the eyes of the negro race which they appear to have had from time immemorial. It is said that they annoy the Elephants so much that they will not remain in the same district; but it is doubtful whether the great Proboscidean could flourish where the Mandrill cares most to live, for he is neither a forest nor a plain Ape, but, like the rest of the Baboons, travels far and wide from his rocky home. They associate in bands like the other Cynocephali, and behave as they do when plundering; but it appears to be true that the Mandrills are often found in small numbers, and that then they devote themselves to hunting for insects rather than to predatory excursions. Very little is



THE MANDRILL.

known about their habits in the wild state in Africa, and it is evident that they are avoided rather than watched by the Blacks.

Although, from the scantiness of reliable information regarding their habits when living at liberty, the Mandrill is of no great interest to the ordinary naturalist, still, the comparative anatomist, having had the advantage of dissecting both tame and wild specimens, considers this Monkey, which is ordinarily placed last in the scheme of the classification of the Old World kinds, of very great interest. For, placed low down in the Monkey scale, and remote from the man-like Apes, it approaches the flesh-eating animals, or Carnivora, in many points of its construction, and, if not exactly, still approximately, and in their general character.

The back-bone, for instance, although its curves recall those of man, is eminently that of the brute, that is to say, it greatly resembles that of many kinds of quadrupeds. The pieces, or vertebræ, of the back (dorsal) have, of course, spines, but they do not slope backwards; on the contrary, those of the last three are directed forward; and the loin, or lumbar vertebræ, are six or seven in number,

and there is an arrangement by which their general strength is increased, by a forking of the joint-bearing processes which unite them together by the formation of a bony structure. These peculiarities connect the Mandrill, whose common position is on all-fours, with the inferior quadrupeds, for they exist in them. Then there is no true sacrum bone, but two or three back pieces (sacral vertebræ), form a short conical sacrum—one attached separately to the hip-bone on either side. This is like the arrangement in the Carnivora. The hip-bones are long, narrow, and deeply excavated behind, or rather externally; the front of the bony girdle of the loins (the pelvis) is long; and the bones (the ischial) on which the Mandrill sits are very broad and semicircular. Now, these three apparently simple matters of anatomical detail are not only of interest to those who recognise the analogies of the same parts in different animals, for they relate to means, to ends, and commend themselves to the

YOUNG MANDRILL. (*From a Sketch at the Zoological Gardens.*)

consideration of ordinary observers. The shape of the hip-bone on either side, so unlike that of man and the man-like Apes, perhaps the Gibbons excepted, depends upon the relation of the muscles which move the hind-quarters and their bones, and the hollow in the hip is well filled up by those which pass backwards to the thigh. The position of those muscles assists the motion of running on all-fours and of springing. The length of the girdle (the front of the pelvis or pubic bones) relates to the dimensions of the digestive and reproductive organs. The great size of the haunch-bones, or rather of their ends, is due to their being covered by the great pad-like hard parts, or callosities, on which the creature sits very constantly. Instead of having the soft muscles so familiar to the human anatomist well and largely developed there, it has this mass of fat cellular tissue and coloured skin attached to a curved bone, the whole being a most comfortable seat, and very constantly used by this restless Monkey. The bones of the tail are few in number, for it is short, but the muscles which wag the organ in Monkeys, in which it is of some size, are still present at its root. There is a capacious chest in the Mandrill, but its bones, or rather the ribs which partly form it, are, as it were, pressed in at the sides, so that it is not round like that of the higher Apes, but rather long and flat at the sides, and thus resembles the

chest of the Semnopitheci on the one hand, and that of the lower four-footed animals on the other. It has good lungs and a strong heart, and the intestines, stomach, and liver do not occupy as much space relatively as in the genera of Monkeys already described.

There is a singular approach in the conformation of the fore hand to the paw of the Carnivora, and a great departure, so far as resemblance is concerned, from that of man in the Mandrill. It is produced by the relative length of the bones which unite those of the wrist to those of the fingers; for these so-called metacarpal bones, four in number, leaving out that of the thumb, are of the same length, and not unequal, as in the higher Apes and in man. Therefore, the middle finger of the Mandrill is not longer than the others, and hence the peculiarity of the hand as a whole. This is noticed in some Macaques to a certain extent.

There is one anatomical peculiarity of the body which may also be noticed, as it relates to the movements of the animals, and their trotting and galloping on all-fours. The pieces of the back-bone in the neck have processes which project outwards (transverse processes), and in the Mandrill they have a triangular shape, and a ridge exists upon them, which is the representative of a very distinct piece of bone in most of the other Mammalia. Now, this structure appears to have to do with the attachment of a muscle which is also present in the Macaques, and which reaches from these transverse processes to the spine of the blade-bone (scapula), and its duty is probably to draw this bone forward, and to assist the fore limb in progression.*

Most of the peculiar muscular arrangements of the Cynomorpha previously described are repeated in the Mandrill; but it has some which are of great interest. Thus, the great chest muscle (pectoralis major), which reaches in the higher Apes from the front of the chest to the upper arm-bone, is very large in the Mandrill, and is divided into three portions, and the great air sac of the neck projects between them. There are also muscular fibres connected with the back, which assist the animal in pulling back its upper arm, and they give force not only to blows, scratchings, and tearings, but also velocity to the movements of the whole limb in moving along the ground. Strangely enough, there is a curious resemblance between the muscles of the thumb of the Mandrill and of the Orang-utan, two of them being united together, so as to give the thumb seven instead of eight; the tendons of these muscles (the long adductor and the short extensor) remain, however, separate. This is a part of the anatomy which recalls the corresponding structures in the Carnivora, and indicates the restricted amount of movement in the thumb of the lower Apes and Monkeys.

SKULL OF THE MANDRILL.

Having a good digestion, the Mandrill has a tolerably large liver, but it is separated into several lobes, or pieces, which are more in number than those of the other genera; but as it is partly insectivorous in its diet, there is no necessity for a very full-sized large intestine, and this is not furnished with the appendix noticed in the man-shaped Apes.

Finally, as regards the skull, it may be said, that that of a large adult Mandrill is the strongest created; so huge are the jaws, face, teeth, and crest-ridges, that one wonders where its brain can be put in life. The true brain case is indeed small, and is encroached upon inside by the back of the orbits, whence the eye looks out under the "beetle-brows."

The forehead bone is triangular looking, and there is no ascending of the forehead, the bone being, as it were, crushed flat, so as to make a triangular space with the brows in front. Ridges exist on the sides of this space, and pass backwards to the occiput, where they meet side crests from the ear-bones. The occiput is stuck up in a singular manner, and the surface of the bone is strongly marked by the muscles which draw the head backwards. Of course the singular part of the skull is the huge ribbed prominence of the upper jaw-bone on the side of the nose, and the great upper canine teeth.

* The *Acromio-trachelian*. It does not exist in the Chimpanzees.

THE DRILL.*

Very little is known about the habits of another Baboon which is found on the coast of Guinea, and which is called the Drill. But it has been described, drawn, and stuffed frequently, and has been called Wood Baboon, the Cinereous Baboon, and the Yellow Baboon. The natives evidently confound it with the young Mandrill; and as it is good tempered when young they capture specimens for European menageries, where they are commonly to be seen. It appears to be a modified Mandrill, like it in temper, and in its disagreeable adult qualities; it has not, however, the grand coloration of the face, although the prominences of the cheek-bones are present.

The Drill is smaller than the Mandrill, and has a short stumpy tail, occasionally two inches in length, covered with bristly hair, and ending in a brush. The colour of the hair is greener than that of the Mandrill, and underneath it is whiter and more silvery, whilst there is much light-brown hair on the upper parts of the limbs. It has whiskers, which are brushed back, and a small orange-coloured beard; moreover, the general tint of the skin beneath the hair is dark-blue, and the dinginess is relieved by scarlet callosities.

The Baboons of Africa certainly lead very exceptional lives for Monkeys. They are the Apes of the rock and plain, and they would be out of place, on account of their method of moving and their general habits, in the dense tropical forests and swampy jungle. Their structure and general conformation are especially suited for their mode of life, and their courage, numbers, and instincts avail them against their common enemies—enemies which the contented dwellers in the woods, such as the Troglodytes, have not. Probably the Baboons are of vast antiquity, for the age of the African hills is great, even geologically speaking. The tree disappears and the woods die away sooner or later, whilst the rock merely crumbles. Certainly the life of the Gorilla and other great Apes is intimately associated and connected with the life of the great trees and the duration of the vast woods of Equatorial Africa. Destroy them, and the days of the Troglodytes would be at an end. But the rocks and hills are not so transient as the woods, and the Baboon will exist long after the higher Apes are extinct. Did he exist before them, and is he the link between them and a still less monkey-like animal? These are questions whose import has not escaped the active mind of one of the most eminent of the present anatomists, and Gratiolet believes in the descent of the Gorilla from the Baboon, and of course that the last preceded the first in time.

The possibility of the descent of the Cynocephali from a flesh-eater only rests upon the resemblance of some of the structures of the Mandrill, for instance, to those of some of the Carnivora. The dog-like appearance of the Baboon of course depends upon its long snout and jaws, but these are very different in their anatomy and construction from those of the Dog. The Cynocephali (Baboons) are the lowest of the Old World Monkeys, but their next-of-kin in the downward classification are not now existing. They are more remote from the Lemurs, which come next below as Quadrumana, than they are from the great Apes.

Hence the Baboon stands very much by himself. He may have possibly very distant relationship with some long-lost forms—creatures which lived geological ages since, and in which the ferocity of the Carnivora was combined with some of the structures of the Monkey; or—and this is the most probable—he may have once lived as a denizen of the forest, and the symbol of Thoth may really have merited the name of Hamadryas. The forest may have succumbed to changes in the physical geography, and the survivors of the slow extinction of the trees had to lead different lives and assume other habits. The Cercopitheci (the Guenons) may have been the old forest Monkeys, and the Macaques, those half Baboons, may be their modified descendants in a line which led to the true Baboon. If this be true, the dog-like characters of the Cynocephali were given by nature during their progressive alterations from the condition of Tree Monkeys.

THE BLACK BABOON.†

There is a small Baboon which is very interesting to the student of the distribution of animals over the surface of the globe and to geologists. It is jet-black in colour, there being hardly a trace of dark-brown in its long hair, and hence it has been called the Black Baboon, or *Cynocephalus Niger*.

* *Cynocephalus Leucophæus.* † *Cynocephalus Niger.*

These animals are found in considerable numbers in the great island of Celebes, situated in the sea between Australia and the mainland of Asia, and they have been introduced by man into the Philippine Islands and Batchian. They are, therefore, extra-African, but they are true short-tailed Baboons, nevertheless.

The Black Baboon, when full grown, is about two feet in length, and the tail measures about an inch. Its face and neck are not covered, but all the rest of the body, the head, and the limbs, have a long black fur, and the hair of the top of the head runs up into a tall long half-curl. The face is long and very melancholy-looking, and the cheeks are smaller, but coloured black on either side of the nose. But the nose does not extend, like that of a Dog, quite to the end of the muzzle, for the creature has a decided upper lip, and the division or septum of the nostrils is long and rather broad, so that these openings look downwards and outwards. The seat has a scarlet tint, and the tail is a mere knob.

THE DRILL.

Nothing is known about the wild habits of the Black Baboon, but it appears to be a wood Ape, and it certainly has not the impudence or the bold aggravating courage of the African Baboon in confinement. They are frequently brought over to Europe, and may be watched in most zoological gardens. They are capital climbers, but they like to remain a great deal on the ground, sitting upright on their haunches in a very sedate manner. Associating very well with other Monkeys, they appear rather affectionate in disposition than otherwise, and may be seen looking very quiet and stately whilst some more agile companion rubs his face and lips against theirs, apparently to their gratification. The distinction between the Black Baboon and the African kinds is slight, and they all belong to the same genus,* and therefore must have had a common parent in remote times. But the black one lives far away in the Asiatic islands, surrounded by animals different from those which live in Africa, many of which, nevertheless, have a curious African look about them. Now, the geologist asserts that there are proofs of the former connection by land of the mainland of Asia, Hindostan, and

* Some zoologists make a new genus (*Cynopithecus*) of the Black Asiatic Baboons. We demur.

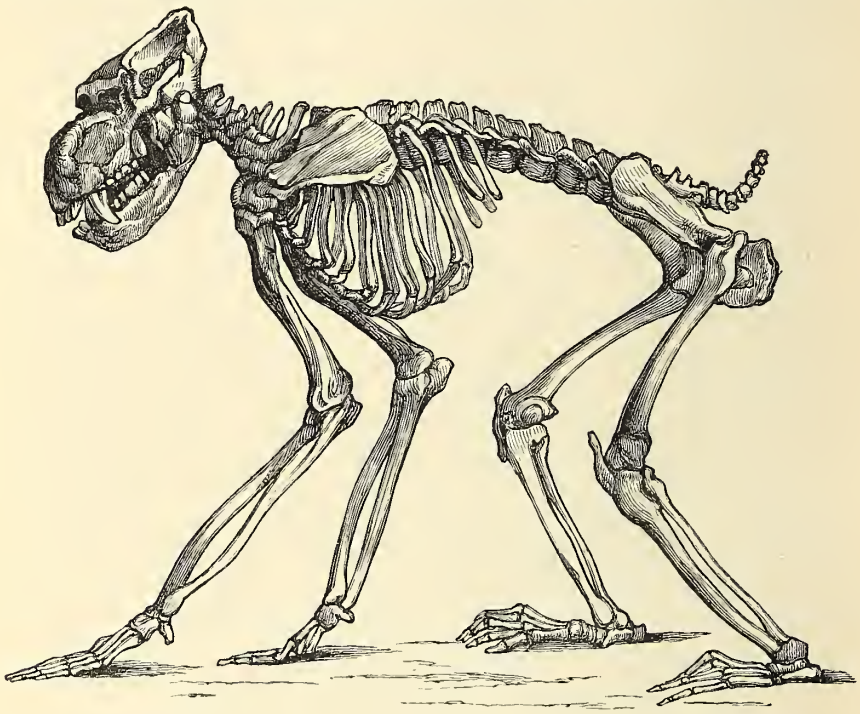
Africa. The facts upon which this assertion is made will be stated in several consecutive chapters of this work. They have already been slightly noticed, and they will be summarised in their proper place. It is only necessary to mention here that the separation of the two great masses of land occurred about the time of the elevation of the Himalayas as a mountain chain, and they are about as old as the Alps of Europe. Hence the Baboons, found as they are in the separated districts, existed as a united genus before those vast changes. If the Black Baboon is a forest dweller—and there appears to be good reason

THE BLACK BABOON.

to believe that this is the case—there is something more than simple conjecture in the suggestion that the whole of the Baboons once lived in forest lands.

The Cynomorpha, or Dog-shaped Quadrumana, include the genera Semnopithecus, Colobos, Macacus, and Cynocephalus, and their distinctions and some of their anatomical peculiarities have been noticed, and they may be summarised as follows:—As a group, the Cynomorpha are more fitted for running on all-fours than for any other method of progression, and their construction relates to that of such running animals as the Cats as well as to that of the Monkeys. Thus the arm-bone (humerus) is unlike that of the man-shaped Apes; it is bent so as to be slightly convex forwards, and the top where the round joint is—the head of the bone—looks upwards and back-

wards, and not upwards and inwards as it does in the Gorilla. The forearm bones, longer than the arm-bone, are modified, and the most movable of them (the radius) is so much jointed to the arm-bone that the power of moving the lower part of the forearm upwards and downwards (of pronation and supination) is much diminished. There is the extra bone in the wrist, making nine, and one of the bones sticks out behind (pisiform), so as to form a kind of heel to the hand. The thumb is complete except in the Colobi, but it is short in proportion to the other fingers; and in some the third and fourth fingers are equal in length, thus departing from the Ape, whose third finger is always the longest, and resembling rather the beasts of prey. The blade-bone differs much from that of the Anthropomorpha, being longer and narrower, and the portion above its spine, instead of being large, as it is in such ponderous climbers, is small. All these arrangements relate to



THE SKELETON OF THE MANDRILL. (From the *Cyclopædia of Anatomy and Physiology.*)

the running on all-fours, the palms of the hands being applied to the ground. Moreover, in order that the hand should thus resemble a foot in its duties, some of its muscles simulate those of the foot and fore-leg. Thus a muscle which extends the metacarpal bone of the thumb (the bone between the wrist and the thumb under "the ball"), and keeps the thumb flat on the ground in running, and tends to pull it up, has a slip which is attached to the bone of the wrist, called trapezium, and which is at the wrist end of the metacarpal bone. It extends the wrist as well as the thumb. Now this is an arrangement seen in the foot, where a muscle extends the great toe's metacarpal bone and the ankle bones also. In order to carry out this extension of the fingers, so as to prevent downward bending (or flexing), they have a complete double set of extensor muscles.

All the Cynomorpha have the lifting muscle of the blade-bone; and the muscle which pulls the elbow back and assists in climbing, both in the Gorilla and its fellows, is present (the slip from the back to the elbow, *Dorso-epitrochlearis*).

The nature of the spine and back-bone processes has been noticed in the Mandrill, but it is necessary to state that the hip and haunch-bones are not closed in behind by a distinct sacrum, as is the case in the Anthropomorpha. The arrangement in the Cynomorpha closely resembles that of the great beasts of prey, but the haunch-bones are turned out slightly so as to form a seat. There is considerable variation in the number of the bones in the back and tail. With regard to the hinder

limbs, the thigh-bone has a round ligament at its joint with the pelvis, and the shaft bends forwards, and when the animal is at rest on all-fours the thigh projects forwards and downwards, thus indicating the almost permanent position of this great bone in most runners on all-fours, the Elephant being a remarkable exception. The heel-bone is flat from side to side, and the toe-thumb, which reaches about half way up the first joint of the next toe, has considerable powers of motion, and can be struck out from the foot or be pulled in. The climbing muscle exists (page 106), as does also the peculiar stretching muscle of the little toe (abductor of the metacarpal bone). A transversus pedis, already noticed, exists. As the fore-limb assists greatly in locomotion, and much climbing is done by it, the "calf" is not much required for the hind limbs; and one of the muscles of it (the soleus) has a comparatively small surface of origin—from the fibula alone. The great muscle of the back of the thigh, which assists in the perfect erect posture and in the running also in man, is incomplete in the Cynomorpha. Its fibres reach from the haunch-bone to the small bone of the fore-leg in these last, but in man they arise also all down the back of the thigh, and enable the knee-joint to be kept straight. All these Monkeys have a muscle on the sole of the foot called the plantaris, but it is not seen in animals lower in the scale than the Quadrumana; moreover, all the other muscles of the sole are more isolated than in man, and consequently they produce more distinct and separate movements of the toes, and especially in the toe-thumb. The tail, so variable in its development, consists of numerous bones, which are modified "back-bones," or vetebræ, and in some there are little bones which are under these, and arranged in a rude V-shape, their office being to protect the blood-vessels which are enclosed by them. The muscles and nerves of this tail are special, and contribute to its different movements. The huge canine teeth and the cutting first pre-molars have been noticed, and it only remains to observe that the Cynomorpha have a first set of teeth (milk teeth) which fall out gradually, and are replaced by the permanent ones. The milk teeth consist of four incisors above and below, two pre-molars above and below, and four true molars above and below, making twenty teeth in all. All these animals, except the first two genera, have simple stomachs, but the liver has several fissures in it in the Baboons (as it has in the Gorilla), and but few in the Asiatic species (as in the Orangs)—facts of no small significance, for it is very probable that the Gorilla is one of the Baboon line, as the Orang is one of the genealogical tree of a Semnopithecus. The brain exhibits all the convolutions seen in the Anthropomorpha, but the very monkeyish external perpendicular one is well marked. The little brain is not uncovered by the brain proper, which is shortest in the Sacred Apes and longest in the Baboons.

The description of the Cynocephali ends that of the Monkeys of the Old World—The Catarrhini—and the whole of the group may be classified as follows:—

Class.—Mammalia.
Order.—Primates.
Family.—Catarrhini.
Sub-Family.— { 1. Anthropomorpha. 2. Cynomorpha.

1. Anthropomorpha.

Genus—	Troglodytes.	Example—	The Gorilla and Chimpanzee.
,,	Simia.	,,	The Orang-utan.
,,	Hylobates.	,,	The Gibbons.*

2. Cynomorpha.

Genus—	Semnopithecus.	Example—	The Entellus Monkey.
,,	Colobos.†	,,	The Guereza.
,,	Cercopithecus.	,,	The Guenons and Mangabeys.‡
,,	Macacus.	,,	The Magot.
,,	Cynocephalus.	,,	The Baboons.§

* The Siamang is included in this genus.

† This spelling is preferable to "Colobus."

‡ Some zoologists separate the Talapoin Monkey, and place it in a genus by itself; and the Mangabeys are sometimes included in a genus Cercocebus.

§ The Gelada is included by some in a genus Theropithecus, from its nostrils opening high up; and the Black Baboon is placed in a genus Cynopithecus. These are all inadvisable complications.

CHAPTER X.

THE MONKEYS OF THE NEW WORLD.*

THE CEBIDÆ—1. THE HOWLERS—2. THE WOOLLY MONKEYS—3. THE SPIDER MONKEYS—4. THE SAJOUS.

The Monkeys of the New World—How Distinguished from those of the Old—Their Division into Families—The First Family, THE CEBIDÆ, with Prehensile Tails—THE HOWLERS—Appropriateness of their Name—Where Found—General Description—THE YELLOW-TAILED HOWLER—Anatomical Peculiarities and Appearance of the Face—Other Members of the Family—THE BLACK HOWLER—Its Locality—THE WOOLLY MONKEYS—THE CAPARRO AND BARRIGUDO—First noticed by Humboldt—Peculiarities of the Skeleton—THE SPIDER MONKEYS—Seen by Humboldt in the Brazilian Forests—Remarkable Power of the Tail—Flexibility of the Limbs—Conformation of the Brain—Other Species—THE COAITA—Curious Stories of them in Captivity—THE CHAMECK—THE BLACK SPIDER MONKEY—Its Geographical Range—Its Position in Sleep—THE VARIEGATED SPIDER MONKEY—THE SAJOUS—THE CAIARARA—Observed by Bates on the Amazon—Other Varieties—THE BROWN SAJOU—THE CAPUCHIN SAJOU—Described by Brehm—Their Remarkable Dexterity and Cleverness—Diseases of Monkeys.

NOT one of the numerous kinds of Monkeys which have been noticed in the former chapters has ever been found in the New World—that is to say, on the American continent. The converse is also true, for not one of those which are about to be noticed, and which inhabit the tropical parts of South and Central America, has been seen in any other part of the world.

The two groups are not only distinct as regards their geographical distribution, but they are also different in many very important points of their construction and habits. It is evident that, although it may be said that the resemblances between the Baboons, Macaques, and Troglodytes, for instance, indicate some kind of relationship, and suggest a community of origin, there is nothing of the sort to be traced between any Old and New World Monkeys. They seem to have started from different sources.

All the Monkeys of the New World have the partition between the nostrils broad, and it separates them widely: they open as it were sideways, and the whole of the lower part of the nose is flat. This peculiarity has given the name to the group, as has been explained in the first chapter, and it is accompanied by some others. Thus, with one exception, the numerous genera of the New World Monkeys have the hinder limbs the longest, and they are wont to go on all-fours, the erect posture being only occasionally adopted by the Spider Monkeys. Their thumbs differ less from the other fingers than do those of the Old World Monkeys, and the toe-thumb is large and movable; no cheek-pouches or callosities are seen in any of them, and only a few have air sacs. It is usual to say that the American Monkeys are known by their prehensile tails, but this is only true in part, for whilst some have this member wonderfully developed and useful, others have it incapable of holding on, whilst a few have barely a tail at all. The teeth are more numerous than in the Apes and Monkeys of the Old World, in one set of New World genera; and they are of the same number in another. In the first instance, there are thirty-six teeth instead of the thirty-two so frequently noticed hitherto, and in the last the thirty-two are differently arranged to those possessed by the Old World kinds. For example, in the prehensile-tailed Howlers, there are thirty-six teeth, or one extra tooth in each jaw and on both sides, over and above the usual thirty-two; and this tooth is a false molar, or one of those between the true grinders and the canine teeth. There are thus three false molars instead of two, as in the Old World kinds, on either side in both jaws.

In the Marmosets, which have only thirty-two teeth, there are only two back grinders in each jaw on either side instead of three, as in the Old World Monkeys, but there are three pre-molars in each jaw on either side. All these distinctions are useful in the classification of these American Monkeys, and therefore they have been divided into two families, one having thirty-six and the other thirty-two teeth, and the first family has again been subdivided into the genera with prehensile tails and those without them. The first to be described are the Cebidæ, and this family contains—first, the genera with thirty-six teeth and with prehensile tails; second, the genera without prehensile tails and the same number of teeth.

* *Platyrrhini.*

A GROUP OF HOWLERS.

THE HOWLERS.*

Although articulate speech is denied to the Monkey world, many have very extraordinary voices, the capacity for making a noise being great in them. Thus, the Gorilla has a tremendous voice, and the Gibbons are especially noisy, one of them having been noticed (page 77) to be able to emit something like a series of musical notes. But they are all silent in comparison with the noisiest of all Monkeys—the South American Howlers. The females of this group can make a moderate amount of disturbance, but the males surpass every animal in their prolonged and sustained yelling. Their howlings, commencing often suddenly at the close of day or in the middle of the night, amongst the strange stillness of the great virgin forests, appal the traveller on his first visit. "Nothing," says Waterton, speaking of the Red Howler, "can sound more dreadful than its nocturnal howlings. While lying in your hammock in those gloomy and unmeasurable wilds you hear him howling at intervals from eleven o'clock at night till daybreak. You would suppose that half the wild beasts of the forest were collecting for the work of carnage. Now it is the tremendous roar of the Jaguar as he springs on his prey; now it changes to his deep-toned growlings as he is pressed on all sides by superior force; and now you hear his last dying moan beneath a mortal wound." Humboldt and Bonpland landed at Cumana, and travelled towards the celebrated cavern of Guacharo, and they saw and heard the Howlers often; and on getting into a cold district their horrible din became worse, and was heard at a distance of two miles. This was near the convent of Caripé, which is more than 4,000 toises (a toise being rather more than our English fathom) above the sea, and where the nights are cold. The animal clearly has earned its appellation of the Howler, and might properly have been called Stentor, as was proposed by a distinguished French zoologist. Stentor was a Greek, whose voice was louder than that of fifty men. But Illiger, probably familiar with the writings of the learned Apuleius—that student of Carthage and Athens who married a rich Roman widow, and was therefore accused of witchcraft, and who wrote the "Golden Ass," a book singularly applicable to modern society—called the Howler after the word *Mycetias*, an earthquake with a hollow bellowing noise. The word is from Μύζω (to moan). An old writer (Margrave) wrote in his Natural History of Brazil, in 1648, that all the Howlers assembled in the morning and evening in the woods, and that one takes his place on a tree high up, and motions to his companions to sit down and listen, and then, after having seen them all seated, commences his discourse, pitched at so high a key that at a distance one would imagine that all the congregation were joining in. But this is not the case; only one orator is allowed to speak at a time, and all the rest wait politely, but not very patiently. When he has had enough howling he motions to the whole, who burst out into a fine chorus for some time. Then, by order, they all cease, and the first recommences, and after having been listened to with due attention the whole depart. What the noise must be sometimes, if they all join in, may be gleaned from the fact that Humboldt saw the trees crammed with them, and believed that more than 2,000 may be found in a square league.

It really does occur that when there is an assemblage of these Monkeys—for instance, of the *Mycetes Caraya*—when the weather is warm and open, they make the forests resound in the morning and evening with their overwhelming voices. The males begin the dreadful concert, in which the females, with their less powerful voices, sometimes join, and which is often continued for several hours. It does not appear that any especial cause induces them to begin their noise, and probably they do it because it pleases them, as the birds do in their prolonged songs. Mr. Darwin suggests very forcibly that the females are pleased or attracted by it, liking (as in higher animals) the loudest and most intolerable of the noise-makers best. Hence one Howler is, of course, always trying to outdo the others. But it is true that some Howlers live in pairs and indulge in their vocation all the same. Wallace, however, states that the females do not join in the noise, and that the howling is made before bad weather, and in the evening.

These Howlers are the largest of the Monkeys of the New World, some being nearly three feet in length, without counting the long prehensile tail; they have movable thumbs on their hands, a hairless space underneath the tip of the wonderful tail, and the howling apparatus in the throat.

* *Mycetes.*

They have rather tall heads, with beard and large lower jaws, which, with a thickness about the throat, give the appearance of an unusual swelling being there, the cause of which will be noticed further on. Some have long and others short fur, but generally there is much of it about the head (where it is brushed forwards) and neck. Black and red are favourite colours, and the young of both sexes differ often in their tints from the adults, and so do the males from the females. One kind in particular is decidedly coloured.

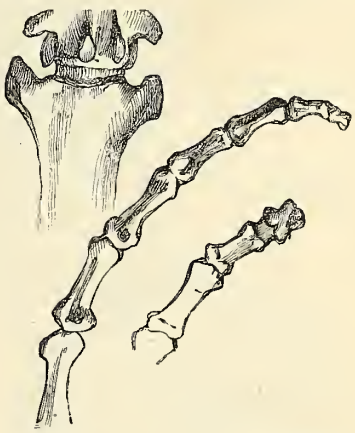
THE YELLOW-TAILED HOWLER.*

The last half of the tail of this species is of a brilliant golden-fawn colour, and this tint is on the upper parts of the body nearly up to the shoulders; the rest of the tail is light maroon, and what remains of the body is dark maroon, there being a violet tint in the limbs.

Besides its colours this kind presents some points of interest. They live in companies, and when they pass from one tree to another they all play at follow-my-leader exactly. They watch the movements of those which precede them, jump in the same manner, and at the same place, and even place their feet and hands on the same spots on the boughs. They are found in Columbia and New Granada, and in Brazil on the confines of Paraguay.

The limbs of all the Mycetes are long, and whilst there is a good toe-thumb to the foot, the very best of the hand-thumbs is not equal to those of the Monkeys of the Old World. The nails on the fingers and toes are compressed from side to side, as it were, and begin to look like claws.

Ogilby, an admirable observer, noticed years ago that two Howlers did not use their hands so as to take things between the thumb and forefinger, and he ascertained that this thumb was so much on a line with the other fingers that it was not opposable in the ordinary sense of the word, and that it was more like an extra finger than a thumb. This, he noticed, was not the case with the Howlers alone, but that it peculiarised the Monkeys of the New World. The examination of their skeletons shows that the bones of the thumb are on the same plane or level as the fingers, and the whole is brought close to the fingers, as our great toe is to the other toes. Nevertheless, this thumb can move to and from the fingers.



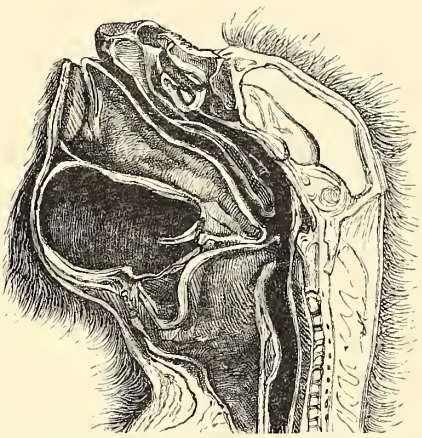
BONES OF THE TAIL OF THE HOWLER.

But if the fore-hand so greatly resembles a paw, compensation is made to the animal by the gift of the prehensile tail, which is very muscular, and the under surface is without hair near the end, so that the sensitive surface can touch and feel objects. They can feel, therefore, around them, and also above them, as they move along and lay hold of branches and hanging creepers without looking for them. The delicate sense of feeling depends on the nervous supply; and the power of clasping and holding on upon the bending or flexor muscles. A bony framework supports all these structures, and runs from the last bone of the sacrum to the tip, and consists of many separate vertebral bones placed in a long series. The first few bones which join on to the sacrum, and form the root of the tail, resemble the back-bone pieces, or vertebræ, to a certain extent. Each has a body, and also processes for jointing with the one before and behind, and a spine also. Besides these, there are two curious projections on the lower part of each body, which are called chevron bones, and are V-shaped, and their use is to allow the blood-vessels and nerves to pass along between them without being pressed upon. Towards the end of the tail the vertebræ become long and stout, and are united behind and in front, forming a broad bone, and without the joints, and the chevron bones are reduced to little rounded pieces of bone. Everything tends in this tail to ready, rapid, and forcible motion, and indeed so perfect an organ is it that when one of these Howlers is shot it always hangs to the tree by its tail, even if quite dead, and does not fall down until some hours afterwards, when the strong flexor muscles have relaxed.

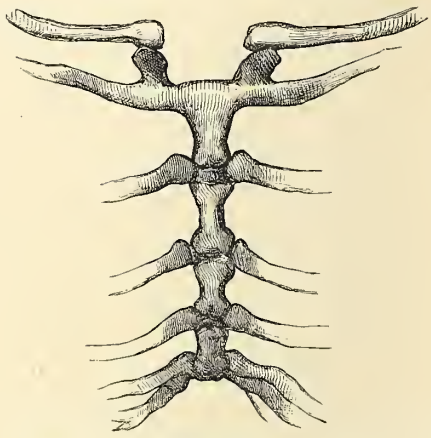
* *Mycetes Chrysurn.*

Therefore, writes a recent author, if fresh food is required, it is best to kill a Lagothrix (see page 171) in the Peruvian valleys, as hung meat soon becomes tainted. The Golden Howler, nevertheless, furnishes the principal animal food to the inhabitants of the banks of some of the rivers entering the Peruvian Amazon. They keep to the low lands and shores of the rivers, and are found moving from place to place in pairs.

The head of this and all other Howlers has a large black face, and a high receding forehead; the chin recedes much, and there is a great jowl produced by the large bones of the lower jaw. There is a curious swelling at the back of the orbit; and the part of that cavity for the eye which joins the cheek-bone has a round hole in it, as if it had been made by a gimlet. It has two nose, or nasal-bones, which

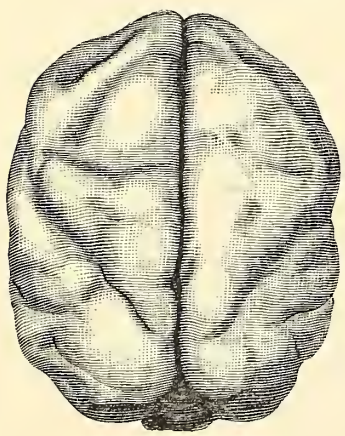


SECTION OF HEAD AND OF AIR SAC OF THE HOWLER.
(From the *Cyclopædia of Anatomy and Physiology.*)



UPPER PART OF BREAST-BONE AND COLLAR-BONES OF THE HOWLER.

remain separate, and the forehead (frontal) bone goes so far back that it joins the side (parietal) bones of the skull in a V-shaped suture, or union, and there is not much back to the brain case, which is depressed in shape, on the whole. They are vegetarians, and yet have very decided canine teeth, those of the upper jaw being large, and they project downwards much lower than the other teeth; and the large lower jaw has evidently quite as much to do with the howling apparatus as with the teeth, for it opens out behind to admit of the great bone of the tongue moving readily within its boundaries.



BRAIN OF THE HOWLER.

This Howler, like all the others, has good lungs, and a windpipe ending, as usual, in the larynx and its thyroid cartilage (see page 22), as in other Monkeys. The bone at the base of the tongue (the hyoid) is attached to this cartilage, as usual, by a membrane, and instead of being a flat curved bone with two projections on either side, called horns, is swollen out into a bag shape, the horns being very small. The bone in other animals is at the base of the tongue, and this is the case in the present instance, although it is so large, the inside of the hollow being able to contain four cubic inches of water. Now, the air from the upper part of the windpipe can get into this cavity, as there is an opening between it and the upper part of the larynx. Hence the same noise is produced as if the animal howled into a resonant shell.

In order to strengthen the voice, the cartilage of the larynx itself is large and strong, and the so-called ventricles of it are enlarged into air sacs, and they unite in front of the "Adam's apple." Besides these there are other sacs connected with the gullet. So that the whole of the front and sides of the neck below and between the sides of the lower jaw are

complicated by air sacs and resounding chambers. The breast-bone of the Howler differs in certain respects from that of all other Monkeys, for its upper bone (manubrium) is halved, and each half supports the end of the collar-bone and first rib. Possibly the resulting space may have something to do with the air sacs.

The possessor of these curious appendages, whatever Howler it may be, for all the species of the genus have them, is active enough in his woods, but still is a sad-looking animal, much given to crawling listlessly from branch to branch, and becoming melancholy in captivity. They have a surly disposition, are never to be made pets of, and are savage; while at the same time they show none of the lively play which makes the Spider Monkeys and little Sapajous so very amusing. Possibly their howling exhausts much of their nervous energy, and certainly their brains are peculiar. The back, or occipital

YELLOW-TAILED HOWLER AND YOUNG.

part of the brain, does not cover the cerebellum, or little brain, which is large in proportion to the rest. The brain is small in comparison with those of the other American Monkeys, due allowance being made for the greater size of the Howler; and its surface markings or convolutions are few and simple.

There is much less brain-matter packed up in folds, or convolutions, than in most Monkeys, and some of the most important are wanting (the angular and external perpendicular), and it has a shrunken and contracted look. Everything shows a low condition of intelligence and mental power. The absence of so much brain-matter behind, so unusual amongst the Monkeys, has suggested to those who believe in phrenology that the bump of philo-progenitiveness was absolutely deficient in this species. But in spite of this, we find that the Howlers are kind to each other, and bring up their solitary little ones, teaching and feeding them with just the same amount of affection that all the other New World kinds display. So the love of offspring is not deficient; nevertheless, it may be assumed that the sameness of habits and the slight requirements of their lives render a more elaborate brain unnecessary.

Finally this and all the Howlers have the stomach a little disposed to be arranged as more than one single sac, and in this there is just the hint of the condition in the Semnopitheci of the Old World.

THE BLACK HOWLER.*

These Monkeys are called the Monos by the natives of Guatemala, and certainly deserve some other name than Howlers. Howling is a moderate noise in comparison with the loud, widely-heard yell which they can produce. The effect of these noises when produced by four or five animals trying their voices one against the other in the quiet forest is most remarkable and unpleasant. Salvin thus writes:—"The wonderful cry whence Mycetes gets its trivial name of Howling Monkey is certainly

THE CAPARRO. (From the *Proceedings of the Zoological Society.*)

most striking, and I have sometimes endeavoured to ascertain how far this cry may be heard. It has taken me an hour or more to thread the forest undergrowth from the time the cry first struck my ear to where, guided by the cry above, I stood under the tree where the animals were. It would certainly not be over-estimating the distance to say two miles. When the sound came over the Lake of Yzabel unhindered by trees, a league would be more like the distance at which the Monos' cry could be heard."

The Monos are abundant throughout the forests of the eastern part of Guatemala, but are unknown in the forest-clad regions which stretch toward the Pacific Ocean. They are particularly plentiful in the unbroken forest country which occupies the northern part of Vera Paz, for seldom an hour passes without the weird outcry falling on the ear of the traveller even when at the height of 6,000 feet. At this height in a cold and damp region, where the forest trees are of the largest growth, these Howlers congregate in the upper branches of the highest trees. Living in small companies of five or six, they crawl sluggishly along the boughs when disturbed. It was from such a locality that

* *Mycetes Villosus* (GRAY).

those specimens of this species were found which are now in the British Museum. The animals afford a dark and not very nice meat, which is readily eaten by the Indians. The young as well as the females are of the same dense black colour as the old males, but the hair is shorter and not so glossy. All have the hair of the front part of the head long and soft, and inclined forward over the forehead nearly to the eyes. There are ten species of Howlers, and they are found in the forests covering the country from East Guatemala to Paraguay.

THE WOOLLY MONKEYS.*

Humboldt, in one of his geographical excursions amongst the great streams which feed the Orinoco, went far up towards their sources. Going once into an Indian cabin in those remote regions he saw a large Monkey, of a kind which he had never seen before. He named it, after the words of the natives, "The Caparro," and from its having a peculiar furry skin which reminded him of the familiar hare-skin of home, he termed it Lagotriche, from λαγώς (a hare), and θρίξ, τρίχός (hair, or fur), and thus arose the genus about to be described.

Humboldt's new Monkey had a prehensile tail which was longer than the body, and underneath, close to the tip, there was a naked and sensitive spot of some length. It had a round and large head, a naked black face, but no beard. There were, however, smellers or long hairs around the mouth. It had long limbs and a shortish body, whose fur was long and sable-grey in colour. A good temper and a quiet disposition appeared to characterise this Monkey, and the natives said it was found in troops, and that it often stood upon its hind legs.

They have thumbs, as well shaped as those of any American Monkey, on the fore-hands, as well as on the hinder extremities. They were deficient, however, in the howling apparatus, and therefore they differ from the Mycetes, and as their thumbs were noticed to be large, they differ from the next group of Monkeys, or the Spider Monkeys.

A careful examination of the skeleton shows that the outside differences are accompanied by inside ones, especially in the skeleton.

Thus, there are fourteen rib-bearing back-bones, or vertebræ, and this increase of number over the ordinary thirteen is interesting, because it makes the animal approach those lower than the Primates; then it has four loin vertebræ, and three are in the sacrum bone. There is a curious growth of the second vertebra of the neck or the axis, for its spine is trifid, and has three projections for the attachment of muscles. Finally, the long tail is very elaborate in its bony part, and seven of its bones near the root have so great a resemblance to the back-bones higher up in the body, that they have a canal like that which in the others protects the spinal marrow, which, however, does not reach further down than the lower loins. Then five of them have good strong spines, and all have the chevron, or V-shaped, bones underneath well grown.

This tail is quite as useful to the Lagothrix as it is to the Howlers and to the Spider Monkeys about to be considered, and they feel with, and swing and hold by it, to perfection.

The Caparro is about two feet two inches in length without the tail, and has been subsequently to its description by Humboldt called *Lagothrix Humboldtii*, or Humboldt's Lagothrix.

THE BARRIGUDO.†

Bates says of this Monkey, that it is, with the rest of those found in the district of the Upper Amazon, arboreal and diurnal in its habits, and that it lives in troops, travelling from tree to tree, the mothers with the children on their backs; leading, in fact, a life similar to that of some Indians, and like them occasionally plundering the plantations which lie near their line of march. The Barrigudo is the "big-bellied Monkey" of the Portuguese colonists, and they are very bulky animals. They have the head clothed with grey, and they live with the Caparro mentioned above, in the same forests, and lead the same kind of life. One measured twenty-six inches in length, and the tail six, and it was the largest Monkey he saw in America, with the exception of a

* *Lagothrix.* † *Lagothrix Olivaceus.*

Black Howler, who was twenty-eight inches in length. The skin of the face of a Barrigudo is black and wrinkled, the forehead is low, and the eyebrows project; and, in short, the features resemble in a striking manner those of an old negro. It is not an active animal in the forests, and lives exclusively on fruits, but is much persecuted by the Indians on account of the excellence of its flesh as food. From information given to Mr. Bates he calculated that one troop of these Indians numbering about 200, destroyed 1,200 Monkeys a year for food. Consequently they are diminishing in numbers, and are not found on the Lower Amazon at all. Its manners in captivity are grave, and its temper is mild and confiding. Owing to these traits the Barrigudo is much sought after as a pet; but it is not hardy, and seldom survives a journey down the river.

There are five species of the Woolly Monkeys, and they are found in the valley of the Upper Amazon and along the slopes of the Andes to Venezuela and Bolivia (Wallace).

THE SPIDER MONKEYS—THE THUMBLESS MONKEYS OF AMERICA.*

Many early travellers recorded that during their wanderings by the sides of the rivers of the northern part of South America, and in the Isthmus of Panama, small troops of dark-coloured Monkeys could be seen rushing along amongst the trees, swinging under the branches, and feeding upon berries. Sometimes they would stop on the lower branches of the trees and look at the intruders; but usually they scampered off, swinging with their front limbs and clasping with the hinder, having their stout and long tail ready for emergencies. Their length of limb, slender bodies, long hair, and their long tail, by which they suspend themselves, and their extremely variable movements, soon gave them the name of Spider Monkeys amongst those interested in their habits, although, of course, the natives had some names of their own for them.

Humboldt saw them in the great virgin forests of Brazil, hanging in curious clusters, clasping each other by means of their limbs and tails, and all being suspended by the tail of one strong fellow. He was, as everybody must be, greatly impressed with their clever use of their tails, for he observed them being used as a fifth member, and with all the dexterity of hands. The natives will have it that they fish with their tails, but this is of course untrue, and they do not carry anything to their mouths with them. They are wonderful swingers and claspers, and they are exquisitely sensitive at the tip and for some inches underneath it, and they are stout where they join the body, exceedingly muscular, and in some kinds there are long hairs on them, especially near the end.

These Monkeys have small heads, long necks, and exceedingly long arms and legs; some are covered with a soft fur, and in others it is harsh, and the hairs are long and rigid; and all have the thumbs of the hands either absent or just visible as slight projections. The feet are long and have well-shaped toe-thumbs. Their head is round, and the muzzle only projects slightly, so that there is something human in their appearance, especially when their large eyes are open; and the hair in some kinds is brushed forwards on the cheeks and brows so as to resemble whiskers and front hair. There is something in their shape, without the tail, which reminds one of the Gibbons, those long-armed Apes of the East, and the fore-hands resemble those of the Colobi of Africa (page 100); but the Spider Monkeys have not the power of jumping possessed by these, and their hind legs, useful as they are when amidst the great trailing orchids and the climbers of the American tropics, are feeble members when on the ground. Then the Monkey walks on the outside edge of the feet, and on the inside edge of the hand, with its tail feeling here and there for anything to catch hold of. Often they are very sedate and slow in their movements, like the Semnopitheci of India, and they indulge in a series of climbings from bough to bough, swinging from one to the other, and holding on now and then and assisting in the movement with the tail. They are as gentle in their manners as those just mentioned, and are full of play with each other.

Their teeth resemble those of the Howlers, but the eye teeth, or canines, are smaller, and the crushing teeth, or molars, are rounder.

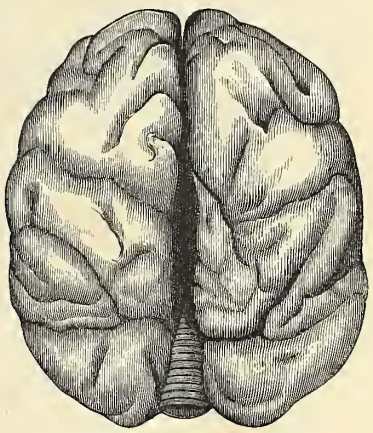
From the defective thumbs, all these Monkeys as a group or genus has been termed "imperfect handed," and therefore two Greek words which convey these terms ἀτελής (imperfect), and χείρ (the hand), have been conjoined in the word Atelochirus, of which Ateles is used as an abbreviation.

* *Ateles.*

GROUP OF SPIDER MONKEYS.

But on examining the hands carefully, and noticing the deep parts as well as the outside, it was found that they could be ranged into two sub-groups. In one there is no external appearance of a thumb, and in the other there is a stunted projection, but in both the member is not quite deficient so far as its bones are concerned. In the first group the metacarpal bone (the bone which is in man covered by the ball of the thumb, and which extends from the wrist to the first joint) is just seen, but it does not project; and in the second group there is one phalanx or thumb-bone on the metacarpal, and this sticks out and is covered with skin so as to resemble a hard pimple. In one kind this little thumb has no nail, and in another there is one on it.

It is curious that some of the woolly-haired kinds of Ateles should have no thumbs and others their rudiments; and that this should be the case in the long and harsh-haired kinds also. There are many kinds of Ateles, and there is consequently some difficulty in recognising them as species, and many attempts have been made to classify them, so that they might be readily distinguished. Those with short and thick thumbs have been called Brachyteles, and those without them Ateles; those with woolly fur have been termed Eriodes, but all are now included in the genus Ateles.



BRAIN OF THE SPIDER MONKEY.

Everybody is interested in seeing the curious sprawling swinging of the Ateles in the Zoological Gardens, and also in noticing the curious way in which some can place their hand right over the head nearly on to the opposite shoulder, and brush the hair with it forwards, and especially because both kinds of movement refer to the great length of the fore-limbs. On the contrary, although they can maintain the erect posture for a short time, they seem feeble about the hind limbs, which are shorter than the others. Their heel-bones are evidently short, so that leaping is never well done.

They are fruit and vegetable eaters, and enjoy eggs, and a nut occasionally, but they have no cheek-pouches. They have, however, an air-pouch, or sac, in front of the throat, but none of the noise-making gifts of the Howlers, and this sac enters the windpipe differently to those of the Monkeys of the Old World, and this is very curious. It opens into the windpipe below the cartilage which forms the "Adam's apple" in man, and not above and between it and the tongue. Below this cartilage, which is called the thyroid cartilage, there is another attached to it by which it joins on to the rings of the windpipe. The opening is between this lower cartilage, the cricoid,* and the top ring of the windpipe.

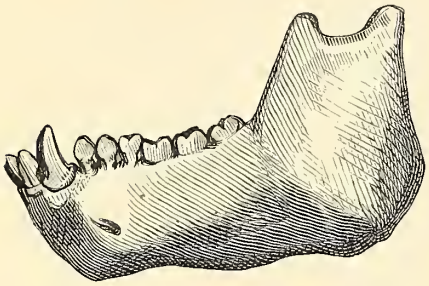
Their stomach is single, and the large intestine, as they are vegetarians, is large, and its termination the "cœcum" also, but it has no little worm-like appendage as in the Gibbons. No especial points have been noted in the muscular system, except the very curious fact that, although the bones of the thumb are so rudimentary, the muscles are all there except the one which principally bends it forward.

As the activity of the Spider Monkey is marvellous, as they swing on and catch hold of boughs with great skill and energy, and as they display much intelligence, their brains ought to be well developed. Doubtless there is a great deal of movement in these long-limbed creatures which takes place like the walking of man, *i.e.*, without direct thought, for we move our leg muscles, and all those which assist them in the act of walking, without a constant direction of the will. Just as man's walking is thus said to be done automatically, so much of the swinging and progression of the Ateles is produced without direct exertion of the will. But it is evident that the Spider Monkey judges his distance, and very often considers whether such and such a bough will bear his weight, and uses exactly sufficient muscular exertion for what he requires.

Moreover, there is a graceful co-ordination or mutual action of the muscles of the limbs, body, and tail to a common end in most of its movements which are evidently done by will. The movements of the tail are perfectly wonderful, and, indeed, so perfectly does it hold on, although the animal cannot

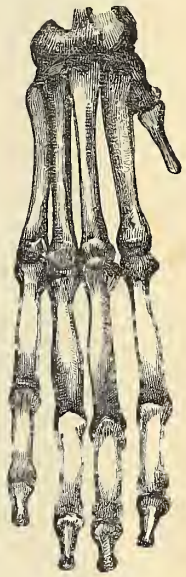
* Κρικος (a ring); Ειδων (like).

see what this long slender organ is doing, that most children think there is an eye at the end of it. Directly the Spider Monkey rises on its hind legs, up goes the tail straight behind its back, and curves a little at the tip downwards: the delicate hairs stick out and feel the slightest touch or passage of air; and the least touch induces the last few joints to clasp hold. The animal will walk along and catch hold of things with its tail at every other step or so, and will change its hold in exact proportion to its rate of progression. All these movements necessitate clasping, unclasping, twisting, and a regular succession of efforts, and are not likely to be carried out except by an animal with a well-developed nervous system. Hence it has been a matter of some interest to compare the brain of Ateles with those of other Monkeys, and even with that of man.



JAW OF THE SPIDER MONKEY.

Even in this Monkey, which is low in the scale on account of its having badly-developed thumbs, the structures of the brain greatly resemble those of the Monkeys of the Old World. The nerves are large in proportion to the substance of the brain, and the brain proper is narrow in front and hollowed out beneath, where it rests on the orbits. But these proofs of a low kind of intelligence and of great muscular power are accompanied by structures which mimic or sketch out those of the human brain in an extraordinary manner. The cerebellum, or little brain, is large, as it is the organ which has much to do with regulating and co-ordinating the movements of the muscles, but it is quite covered by the back part, or posterior lobes, of the brain. Inside the brain the cavities called the ventricles may be seen, and they are made on the human plan, for the cavity on either side (lateral ventricle) has a front part, a back part, and a deep one, and on its lower surface, or floor, certain roundings, which are called by odd names, such as the hippocampus minor and the hippocampus major. These are visible in the brain of Ateles as they are in man. Now, it is very remarkable that, allowing for the difference in the size of the brain of most other Monkeys and of man, that the Spider Monkey should have larger posterior lobes to its brain than they have. Moreover, this unusual size produces a greater length of the back part (or horn, or cornu) of the lateral ventricle in Ateles. The difference, however, between the packing of the nervous substance of the brain in man and in the Spider Monkey is vast, for in this last there are few convolutions, but the principal are happily said by Huxley to sketch out the position of the most important in the human brain. The projection of the back part of the brain of the Spider Monkeys over the cerebellum is at least one-tenth of an inch. Hence there is much nervous matter in the back part of the brain, and this compensates for the narrowing and diminution of nervous matter in the front. Are the nerves, then, which give the Spider Monkey its wonderful power of activity and complicated movement, situated in the back part of the head? At present physiologists have not satisfactorily shown what are the offices of these back or occipital lobes of the brain; the rounded floor of the cavity in the brain, which goes by the absurd name of hippocampus, because it is curved like a "sea horse," and which is well seen in Ateles, has much to do with the sensation of touch, and the nervous matter at the sides of the brain appears to be connected with the nerves of the muscles of the limbs. The Ateles lead a life of very great sameness in their forests, and their perceptions and intelligence are never greatly stimulated, hence the fore part of the brain is small.



HAND OF THE SPIDER MONKEY.

THE COAITA.*

This is the Monkey of which an extraordinary story is told by Acosta. It belonged to the Governor of Carthagena, and was regularly sent to the tavern for wine. They who sent him put an

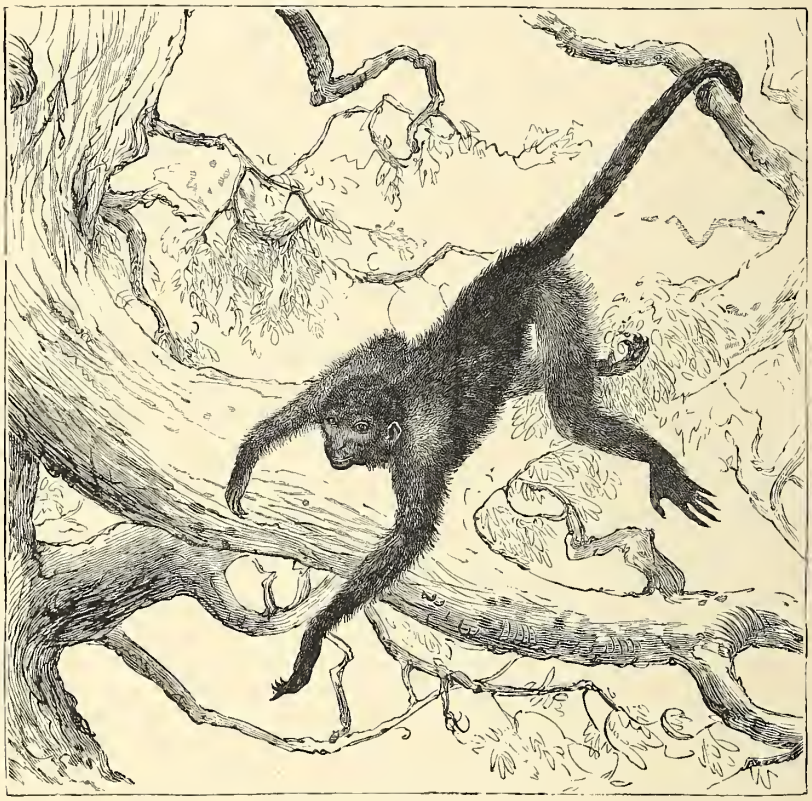
* *Ateles Paniscus.*

empty pot in one hand, and the money into the other, whereupon he went "spidering," as Broderip terms it, to the tavern, where they could by no means get his money from him till they had filled his pot with wine. As the ganymede of the Governor came back with his charge, certain idle children would occasionally meet him in the street, and cast stones at him, whereupon he would put down his pot, and cast stones at them, till he had assured his way; then would he return to carry home the pot. And what is more, although he was a good bibber of wine, yet would he never touch it till leave was given to him. It is about as true as the account of the habits of the genus given by a distinguished French author. He says that they live in greater or smaller troops in the forests; their food consists of insects, and they also eat little fishes, mollusks (shellfish), and other animal substances. When they are a little way from the coast they sometimes come down to the beach by the sea-side and collect such things as oysters, and they get at the inside by breaking the shells between stones. Most of the species live far away from such luxuries, and one and all are vegetarians, as a rule, and eat an insect or suck an egg or two as the exception.

The Coaita, or Quata, is large for an Ateles, and is covered with long, coarse hair, of a glossy black colour, the under part at the groin being without any. The hair of the head is directed forwards, and conceals the ears, which have no lobe, and the face is of a reddish flesh-colour. It is an intelligent animal, and shows much curiosity when anything new is seen in its vicinity. All the agility of the genus is to be witnessed in its climbing and swinging from tree to tree; and it has no thumbs. They live in Surinam and in the Brazils. Bates, when living on the Lower Amazon, saw much of this Monkey, or Coaita, as he properly terms it. He describes it as a large black Monkey, covered with coarse hair, and having the prominent parts of the face of a tawny, flesh-coloured hue. Moreover, he found that the natives esteemed its flesh very much, and the military commandant of the place used to send out a hunter every week to shoot one for his table. "One day," writes this author, "I went out on a Coaita hunt, borrowing a negro slave of a friend to show me the way. On the road I was much amused by the conversation of my companion. He was a tall, handsome negro, about forty years of age, with a staid, courteous demeanour, and a deliberate manner of speaking. He told me he was a native of Congo, and the son of a great chief, or king. He narrated the events of a great battle between his father's and some other tribe, in which he was taken prisoner, and sold to the Portuguese slave-dealers. When in the deepest part of a ravine we heard a rustling sound in the trees overhead, and Manuel soon pointed out a Coaita to me. There was something human-like in its appearance, as the lean, dark, shaggy creature moved deliberately amongst the branches, at a great height. I fired, but only, unfortunately, wounded it in the belly. It fell with a crash headlong about twenty or thirty feet, and then caught a branch with its tail, and remained suspended in mid air. Before I could reload it recovered itself, and scrambled nimbly to the topmost branches, out of the reach of a fowling-piece, and we could perceive the poor thing apparently probing the wound with its fingers." He states that "Coaitas are more frequently kept in a tame state than any other Monkey. The Indians are fond of them as pets, and the women often suckle them when young at their breasts!! They become attached to their masters, and will sometimes follow them to a considerable distance. I once saw a ridiculously tame Coaita. It was an old female, and had accompanied its owner—a trader on the river—on all his voyages. By way of giving me a specimen of its intelligence and feeling, its master set to and rated it soundly, calling it scamp, heathen, thief, and so forth, all through the vocabulary of Portuguese vituperation. The poor Monkey, seated on the ground, seemed to be in sore trouble at this display of anger. It began by looking earnestly at him, then it whined, and lastly rocked its body to and fro with emotion, crying piteously, and passing its long, gaunt arms continually over its forehead, for this was its habit when excited, and the front of the head was worn quite bald in consequence. At last her master altered his tone—'It's all a lie, my old woman, you're an angel, a flower, a good, affectionate old creature,' and so forth. Immediately the poor Monkey ceased its wailing, and soon after came over to where the man sat." The disposition of the Coaita is mild in the extreme. It has none of the painful restless vivacity of the Cebus, and no trace of the surly, untamable temper of the Howlers. Bates says it is an arrant thief, and that it shows considerable cunning in pilfering small articles of clothing, which it conceals in its sleeping-place. The natives of the Upper Amazon procure the Coaita when full grown by shooting it with the blow-pipe and poisoned darts, and restoring life by putting a little salt (the antidote to the poison with which the darts are tipped) in its mouth. The

animals thus caught become tame forthwith. Two females were once kept at the Jardin des Plantes, in Paris, and Geoffroy St. Hilaire says they rarely quitted each other, remaining most part of the time in close embrace, folding their tails round each other's bodies; they took their meals together, and never squabbled over their favourite fruit.

The same traveller when once very hard up for food was obliged to kill a white-whiskered Coaita, and cook it. He writes:—"I thought the meat the best flavoured I had ever tasted. It resembled beef, but had a richer and sweeter taste. We smoke-dried the joints, and the last one was an arm with the clenched fist. This I used with great frugality, hanging it between meals on a nail in the cabin, and nothing but the hardest necessity could have driven me to an act so closely resembling cannibalism."



THE COAITA.

THE CHAMECK, OR TSCHAKMECK.*

An old author, Von Sack, in his voyage to Guinea, gives the following account of the manners of this Spider Monkey:—"It is of a very docile disposition, and capable of being quite domesticated. I have seen a pair of them at a gentleman's house at Paramaribo, which were left quite at liberty. When the female negroes were employed at their needlework, they used to come and sit amongst them and play with pieces of paper, and afterwards go and gambol amongst the trees, but never went over to the neighbouring gardens. They well knew the hour of dinner of their master, when they would come to the gallery, look in at the windows, though without attempting to enter into the room, being aware that this was a liberty which was not allowed them; they therefore patiently waited for their dinner outside."

The Latin name of this species refers to its having hardly five fingers. It has four and a short stump of a thumb, visible and useless, but consisting of two bones, the usual muscles, and the skin

* *Ateles sub-pentadactylus.*

covering. It is larger than the Coaita, and is black, and covered with long hair, but the face is brown. The tail is considerably longer than the body.

THE BLACK SPIDER MONKEY.

This Spider Monkey is more interesting for its geographical range and favourite localities than for anything else. It lives in Central America, north of Panama, and is common in the neighbourhood of the volcano called Orizaba, in the state of Vera Cruz. It lives in companies in the deep barrancas, up to an elevation of two thousand feet above the sea, and in the State of Oaxaca it roams in the forests up the country to a height of four thousand feet, being the same elevation to which the Tapir often reaches in its roaming. It is a black Ateles, with very long hair, which spreads out in all directions, but there is grey-white on the inside of the limbs, and underneath. It has no thumbs on the hands.

THE CHAMECK.

The position which the Ateles take in resting is often very curious. The great Apes of the Old World can lie on their backs like a man, and the Monkeys with callosities sit on them, and, drawing up the knees, let the head fall on to them, or on to the breast, bringing the arms forward when they sleep. But the want of callosities, and of the peculiar flatness of back which characterises the Anthropomorpha, prevents the American Monkeys from adopting either of these positions. Many lie on their sides, and others huddle up in parties, but the Ateles often lie across two or three rope-like horizontal stems, with the face looking downwards, a turn being taken by the tail round the support to insure safety. The length of the back has something to do with this, and of course with their extraordinary agility. The dorsal region of the back-bone, or that which bears ribs, is as long in comparison with the other (neck and loin) regions as in any Monkey; indeed, the maximum of length is attained. There are either thirteen or fourteen back-bone pieces (vertebræ), which have ribs attached to them. The lower vertebræ are four or five in number, and the tail is at its maximum of length in relation to that of the body, its pieces (caudal vertebræ) being very complicated near its root. There, eight pieces (vertebræ) are so like those of the back that they have spines, cross processes, of course without ribs, jointing processes, and a similar nervous canal to those which are higher up in the body. The spinal marrow does not go down it, however. Underneath them are the V-shaped, or chevron, bones. The end bones are short and thick.

THE VARIEGATED SPIDER-MONKEY.*

These Monkeys appear to go in small parties, passing through the forests at a rapid pace, feeding on different kinds of berries. The berries which Mr. Bartlett found in their stomachs resembled a

* *Ateles variegatus.*

gooseberry with a large stone inside. Owing to their great length of limb and tail, and to their muscular vigour, these Spider Monkeys travel far and wide. They are found on both sides of the Peruvian Amazon (or Marañon), and on both sides of the Huallaga. They are also common on the Rio Tigri, and range along the lower spurs of the Andes, across Ecuador and Columbia, over the head waters of the Rio Napa, Rio Japura, and Rio Negro, where it was first discovered. They have also been found in Venezuela. Bartlett endeavoured to hunt them on the Rio Tigri, a small tributary that runs into the Amazon about four miles above the town of Nanta, on the north-western shores of the Peruvian Amazon, but was prevented by the fever and ague of the climate, and the fears of the Indians. Going into the mountains up the Marañon River, he heard from the Indians of the presence of a long-armed Ape—called in their language Maciosuppeh—at the distance of three days' journey. He engaged three Indians, started by way of a forest footpath that had been opened by a Catholic priest, to the town of Moyahamba, as part of his penitence.. He writes :—"At the end of three days I reached the highest point of the mountains; here we came across a number of the Monkeys in question—about eight or nine. I shot the male that is now in the British Museum, and my Indians brought down another with a poison-dart. Having obtained two of them I was satisfied that I had found a new species. While, however, I was busily engaged preparing the first specimen, my Indians had quietly placed the other on the fire; and, to my great horror and disgust, they had singed the hair off, and thus spoiled the specimen. Of course I was obliged to keep the peace, for they had not tasted meat for some days, and the Monkey proved a very dainty dish."

THE HOODED SPIDER MONKEY.*

Probably one of the most extraordinary looking creatures in the world is *Ateles cucullatus* (Gray). This very spidery-looking Monkey has a very curious head of hair, which looks as if it sadly required cutting, for it comes over the forehead, and forms a regular hood, which expands over the eyebrows. Everywhere the fur is long and flaccid, and of a blackish silvery-grey colour. The face is reddish, the cheeks and lower jaw being nearly bare of hair; the skin, however, is of a black shade. The skin around the orbits and upon the nose is bare, and of a brownish flesh-colour. The body is about fourteen inches, and the tail twenty-seven inches in length. The tail is stout near the body, and becomes very slim towards the end, the greater part of it, especially the under surface, being extremely hairy. The length of the hind feet, the long scraggy limbs, the spare, long body, and its great agility, give the Monkey a most extraordinary appearance. Probably it comes from the northern coast of Columbia.

There are many species of Ateles, and they range on the Pacific side of Guatemala, on the west side of the Andes, and in the forests watered by the great rivers.

THE SAJOUS, OR CAPUCHINS.†

If attention has been paid to these descriptions of the groups of American Monkeys already described, it will have become evident that they can readily be distinguished one from another. Thus, the Lagothrix has a round head without a beard, a prehensile tail, with the hair off it underneath, not far from the tip, and its thumbs are large; the Spider Monkeys, or Ateles, have small heads, the same kind of tail, and their thumbs are either defective or wanting altogether; and the Mycetes, or Howlers, have high heads and beards, thumbs, the same kind of tail, and the howling apparatus in perfection. Now, the next (and last) genus of prehensile-tailed Monkeys differs from all these in not having the naked spot on the under side of the tail, in having a thicker tail, and a gentle whistling voice. These are the little "masters of the woods," according to Azara, and should be called "Cai" (the "C" is soft), which has been altered to Sajou by the extraordinary talent which the French have of confounding spelling and sounds in other languages. Buffon divides the Monkeys noticed above into the *Sapajous* and the *Sagoins*, the larger kinds belonging to the first, and those about to be noticed to the last. He modified, he says, the words *Cayonason* and *Cayoni*, their *C* being pronounced as *S*.

* *Ateles cucullatus.* † *Cebus.*

But Azara says that the real words are Caigonazon and Cai, they being pronounced as written, and the first means Great Cai, and the last Cai, or Cay, simply Monkey. Sajous is a derivation from Cagoni, and animals properly included by it constitute the genus *Cebus*, but to add to the confusion, Mr. Wallace calls them "Sapajous."

They are the small, active, red-faced, round-headed, long-tailed American Monkeys, which curl the end of the tail downwards, and yet use it to hold on by. They are smaller and more delicate than

THE BLACK AND VARIEGATED SPIDER MONKEYS.
(From the *Proceedings of the Zoological Society.*)

those already described; their teeth are smaller, and they have not large canines like the Mycetes. Vrolik, in noticing the gentle expression of their face, says their movements are graceful and gay, and their "manners a mixture of sweetness, cleverness, agility, and lubricity!"

There is abundant proof to be obtained of their agility and intelligence, and, unfortunately for them, their gifts are valuable in the eyes of Monkey-trainers, and many a little pug, dressed up as a Highlander or soldier, who does tricks in the streets for the benefit of his master, once had a gay life of "lubricity" in the virgin forests of the Amazon.

Bates, in his interesting work, "The Naturalist on the Amazon," refers especially to the following species.

THE CAIARÁRA.*

This (according to this author and admirable observer) is the light-brown Caiarára, and it is pretty generally distributed over the forests of the level country. He saw it frequently on the borders of the Upper Amazon, where it was always a treat to watch a flock leaping amongst the trees, for it is the most wonderful performer in this line of the whole tribe. The troops consist of thirty or more

THE HOODED SPIDER MONKEY.

individuals, which travel in single file. When the foremost of the flock reaches the outermost branch of an unusually lofty tree, he springs forth into the air without a moment's hesitation, and alights on the dome of yielding foliage belonging to the neighbouring tree—may be, fifty feet beneath—all the rest following the example. They grasp in falling with hands and tail, right themselves in a moment, and then away they go along branch and bough to the next tree. It owes its native name to the disproportionate size of the head to the body. It is very often kept as a pet in the houses of the natives, and Mr. Bates kept one for a year, and he thus writes about it:—"It accompanied me in my voyages, and became very familiar, coming to me always on wet nights to share my blanket." It is a most restless

* *Cebus albifrons.*

creature, but is not playful like most of the American Monkeys, the restlessness of its disposition seeming to arise from great nervous irritability and discontent. Its actions are those of a wayward child. It does not seem to be happy even when it has enough of its favourite food—bananas; but will leave its own meal to snatch the morsels out of the hands of its companions. It differs in these morbid traits from its nearest kindred, for another Cebus found in the same parts of the forest—the Prego Monkey—is a much quieter and better-tempered animal. It is full of tricks, but they are generally of a playful character.

The Caiarára keeps the house in a perpetual uproar where it is kept. When alarmed or hungry, or excited by envy, it screams piteously, and it is always making some noise or other, often screwing up its mouth, and uttering a succession of loud notes resembling a whistle. Mr. Bates's little pet used to run after him, supporting himself for some distance on his hind legs, without, however, having been taught to do so. The end of this friendship came at last, and in a tragical manner. "He offended me greatly one day by killing, in one of his jealous fits, another and much choicer pet—the Nocturnal Owl-like Monkey (*Nyctipithecus trivirgatus*). Some one had given this a fruit which the other coveted, so the two got to quarreling. The Nyctipithecus fought only with its paws, clawing out, and hissing like a Cat. The other soon obtained the mastery, and before I could interfere, finished its rival by cracking its skull with his teeth. I then got rid of him."

THE BROWN CAPUCHIN. (*From the Zoological Gardens.*)

Broderip writes about one as follows:—"Humboldt saw at Maypures one of these Monkeys riding a Pig. He used to bide his time, and every morning caught one, which he compelled to perform the part of the horse. Seated on pig-back did he majestically ride about the whole day, clinging to his bristly steed as firmly as ever the Old Man of the Sea clung to Sinbad, not even giving poor piggy a respite at meal times, but continually bestriding him all the time he was feeding in the savannah that surrounded the Indian huts. A missionary had another of these riders, but the missionary's Monkey laid a strong hold on a comfortable Cat which had been brought up with him, carried him well, and bore all his tricks with patience and good humour."

The skull is long, and uniformly round in these animals, and the face is not very prominent. There are two nasal-bones, and the inter-maxillary bone is distinct; moreover, the chin is rounded and receding. With all its powers of teasing, fun, and its intelligence, one would anticipate that the brain would be far superior in its form to the Spider and other Monkeys with prehensile tails; and this is the case, for the convolutions on the outside are almost equal in their number and relative size to those of the Monkeys of the Old World.

There are eighteen kinds of these Capuchins, and the attempt has been made to classify them by the direction of the hair of the head and its colour, but in doing this sufficient allowance has not been made for the influence of sex, age, and the bodily vigour, so that great confusion still exists in their classification.

THE BROWN CAPUCHIN.*

In this species the hairs of the head are brushed back, but it appears that with age some hairs are erected at the sides of the head above the ears into two horns, so as to give it the name of the Horned Monkey.

* *Cebus fatuellus.*

THE WEEPER CAPUCHIN, OR CAI.*

This is known by the black top to its head, and it is small, and brown in colour elsewhere, the face and throat being greyish-yellow.

Brehm gives the following notes about their habits :—"This Monkey is common from Bahia to Columbia, and it chooses wooded country where there is no underwood. The greater part of its life is spent on trees, and it only leaves them to drink, or to visit a field of maize. In the day he wanders from tree to tree, looking for food ; in the night sleeps on the branches of some tree. Generally one sees him in small families of six or ten, of whom the most part are females. It is difficult to observe the animal, because he is so timid and shy. Rengger asserts that he is seldom to be seen. Once he noticed a pleasant whistling noise, and he saw an old male looking timidly around on the highest tree-tops, and then approach. About twelve or thirteen others followed him, of both sexes, and three females carried a little one partly on the back, partly under one arm. Suddenly one of these animals saw an orange-tree with ripe fruit, gave a cry, and sprang up the tree. In a few seconds the whole company were assembled there, and were engaged in picking and eating the ripe fruit. Some began immediately to eat, others sprang, loaded with a couple of fruit, to a neighbouring tree, whose stronger branches provided them with a table. They sat themselves down on a branch, encircled it with their tails, then took an orange between their hind legs, and tried with these to loosen the peel at the top with their fingers. If they did not succeed immediately, they flung the fruit, grumbling and snarling, several times against a tree, by which the rind was broken. Not one tried to peel the orange with their teeth, probably because they were aware of its bitter taste. As soon, however, as a small opening was made, they quickly pulled a piece off, eagerly licked up the juice, not only what was on the fruit, but also what was on their hands and arms, and then ate the pulp. The tree was soon bare, and then the stronger ones tried to rob the weaker, both making the most peculiar grimaces, gnashed with their teeth, tore each other's hairs, and pulled each other roughly about. Others carefully searched the dead branches, lifted up the dry bark, and ate the insects lying underneath. When they were satisfied, they laid themselves along a branch, in the same manner as the Howlers, to sleep. The young ones, however, began to play, and thereby showed themselves to be very agile. They swung themselves by their tails, or climbed up them as if by a rope. The mothers had great trouble with their young, who wished for the luscious fruit. At first they gently pushed their young aside, but afterwards showed their impatience by grunting ; then they seized the disobedient child by the head, and threw it roughly on its back. As soon, however, as they were satisfied, they gently drew the young ones forward, and laid them at their breasts. The mother's love shows itself by the great care with which every old one handles her young, through laying them on the breast, by watching them, by searching their fur, and by the attacks on others who come near. The motions of the young one were neither light nor graceful, but awkward and ungainly. Another time Rengger came upon a family who were about to make an attack upon a maize-field. They climbed softly down from a tree, looked carefully around, broke two or three heads of fruit off, and returned as quickly as possible to the wood, there to devour their booty. As Rengger showed himself the whole troop fled, with shrill cries, through the tree-tops. Every one, however, took at least a head of fruit away with him. Rengger now shot one of these, and saw a female fall with her young one through the branches. He thought he should be able to catch her soon, but, though dying, she caught herself by her tail, and kept him waiting for quite a quarter of an hour. The young one had not left its mother, but rather clung faster to her, though showing signs of fear. After she was dead, and it was taken away, the little thing called in plaintive tones to its mother, and crept near to her as soon as it was let loose. After some hours, however, the coldness of the body seemed to frighten the young one, and it willingly stayed in its captor's breast pocket. Our informant says that in the family of the Cai, the number of females exceeds the number of males. In January the female gives birth to a young one, and keeps it at her breast for the first week, but later on carries it on her back. The mother never leaves her young, not even when she is wounded. Rengger, however, observed that a female, whose arm had been broken by a bullet, tore her young one

* *Cebus capuchinus.*

from her breast, and set it on a branch; but this most likely was to shield the young one from danger rather than to relieve herself of its weight.

"The young Cai is often caught, and tamed. When older they cannot bear restraint; they become mopish, refuse their food, never grow tame, and die in a few weeks. The young one, on the other hand, soon forgets its freedom, becomes attached to people, and partakes, as do many other Monkeys, of their food and drink. They walk on their hind legs for three or four steps, but they are trained to walk upright by tying the hands behind the back. At first they fall frequently, and must therefore be held by a cord from behind. When sleeping they curl themselves up, and cover the face with the arms and tail. They sleep in the night, and when it is very hot, in the middle of the day. At other times they are in constant motion.

"Among the senses of the animal the sense of feeling is the most acute. It is short-sighted, and cannot see at all by night. It does not hear well, for it can be easily surprised. It holds everything that has smell to its nose, and it is often deluded by the smell into tasting what its taste tells it is not fit to eat. The sense of feeling makes up in some measure for the others. It shows itself chiefly in the front hands, less in the hinder, and not at all in the tail. Through practice and teaching this faculty can be greatly cultivated.

"Rengger's Cai knew his master in the darkest night, as soon as he had felt his usual clothing. The cry of the Cai changes according to its emotions. One generally hears a whistling sound, which seems to proceed from weariness. If he demands anything he groans; wonder or embarrassment he shows by a half whistling tone; when angry he cries in a deep, rough tone—'Hu! hu!' When in fear he shrieks; when pleased he chuckles. By these cries the leader of a troop shares his feelings with the others. These they show also, not only by noises and motions, but also by a kind of laughing and crying. The former is the drawing back of the corners of the mouth; but he utters no sound. When crying his eyes fill with tears, which however, never flow down his cheeks. The Cai is very sensitive to cold and damp, and must be kept from them if he is wanted to keep well. This is easy, as he gladly rolls himself up in a blanket. They live about fifteen years.

"The intelligence of the Cai is worthy of notice. He learns in the first few days of his captivity to know his master and his keepers, and looks to them for food, warmth, protection, and help; trusts them fully, is pleased when his keeper plays with him, lets himself be teased by him, and after not having seen him for some time shows the greatest pleasure on his reappearance. He also soon forgets his freedom, and becomes almost wholly a domestic animal. An old male which Rengger had got loose once from his cord, and ran away into the wood, but returned again in two or three days, sought out his keeper, and allowed himself to be tied up. Those who are not badly treated show great fidelity, especially to the blacks, whom they like always better than the whites. The Cai is not only fond of men, but also of animals, and it is no uncommon thing in Paraguay to bring him up with a young Dog, who serves as a horse for him.

"The animal is very sensible, and does not give in to the will of man. One can keep him from doing anything, but cannot force him to do it. On the contrary, he tries to make others bend to his will, and also men, sometimes by caresses, sometimes by threats. Weaker animals must follow his will. This does great harm to his learning. He will only learn those things which he can make use of, such as opening boxes, looking through his master's pockets, &c. As he grows older he gains experience, and knows how to use it. If one gives him an egg for the first time, he breaks it so clumsily that he loses half the contents, but the second time he only breaks the top, and lets no more be lost. He is not often taken in twice by anybody. He soon learns to know the expression of the face, and the tone of the voice.

"The Cai is also very prone to stealing eatables. If caught in the act he cries out with fear before he is touched, but if he is not caught then he pretends to be perfectly innocent, and looks as if nothing had happened. Small articles he hides, when disturbed, in his mouth, and eats them at his leisure. His covetousness is great. What he once gets is not so easily taken away, at the most, by his master, when he likes him very much. His covetousness is made use of to capture him. The niggers clean out a pumpkin through a small hole, and then slip pieces of sugar, &c., inside. They see this, and thrust their arm in, and while so engaged will rather be caught than relinquish their spoil. Besides these qualities, they show curiosity and destructiveness to a great extent.

"They are fond of teasing, and pull the tails of Dogs and Cats, snatch the feathers out of Hens and Ducks, and even tease Horses which are tied up close to them; they also pull their bridles, and are all the more pleased the more worried or frightened the animal becomes.

"Only the Indians make use of the skin, and therefore hunt the Cai down with bow and arrow. The whites prize him most highly in captivity."

Some of these little Monkeys really appear to reason, and are very clever. Rengger states that when he first gave eggs to his Monkeys they smashed them, and thus lost much of their contents; afterwards they gently hit one end against some hard body, and picked off the bits of shell with their fingers. After cutting themselves only once with a sharp tool they would not touch it again, or would handle it with the greatest care. Lumps of sugar were often given them wrapped up in paper, and

THE CAI.

Rengger sometimes put a live wasp in the paper, so that in hastily unfolding it they got stung. After this had happened once they always first held the packet to their ears, to detect any movement within.

This breaking of the egg in a proper manner is as interesting as two well-known facts, one of which may be observed by anybody in the habits of American and other Monkeys. Sometimes a little Monkey has a nut given him, and he is not strong enough to crack it. He will look up into your face with a meaning glimmer of his eyes, and hand you the nut again. Crack it for him, and he receives it as a matter of course. Formerly one of the large Monkeys in the Zoological Gardens had weak teeth, and he used to break open the nuts with a stone, and Mr. Darwin was assured by the keepers that this animal, after using the stone, hid it in the straw, and would not let any other Monkey touch it.

Rengger taught one to open palm-nuts by breaking them with a stone, and so satisfied was it with its performance, that it soon began to experiment on other kinds of nuts, and then it began upon boxes. It also crushed off with blows of a stone the soft rind of a fruit that had a disagreeable flavour, in order to get at the luscious food within.

Some interesting observations were made by Rengger in Paraguay on the diseases of these Monkeys in their natural state. One kind of Cebus was found liable to what we call "colds," or, medically speaking, catarrh. It had all the usual symptoms; was uncomfortable evidently for a while, had a stuffiness in the head, and then its nose ran like that of a child. If the colds occurred over and over again the same result took place as happens in man, for symptoms of consumption came on, and death ensued. Moreover, these same Monkeys suffered from apoplexy, inflammation of the bowels, and even from cataract in the eye. Even the tiny ones suffered like human babies in cutting their second set—or rather in shedding their milk, or first set—of teeth. They became feverish, and often died with the symptoms of fever on them.

The same author saw a Capuchin Monkey taking great and affectionate care of its infant. The flies were teasing it, and the mother drove them away as sedulously as possible. When in its native woods the Cebus Azaræ utters at least six distinct sounds when it is excited, and these seem to produce corresponding feelings in the Monkeys which are listening.

The Capuchins range from Costa Rica to Paraguay.

CHAPTER XI.

THE CEBIDÆ (*continued*)—5. THE SQUIRREL MONKEYS—6. DOUROUCOULIS—7. SAKIS.

General Description of the Second Division of Cebidæ—Without Prehensile Tails—THE SQUIRREL MONKEYS—Described by Buffon and Humboldt—Peculiarities of the Species—Anecdotes by Le Vaillant—A Tragic End—THE WIDOW MONKEY Origin of the Name—THE ONAPPO—Its Nocturnal Habits and Peculiar Cry—THE DOUROUCOULIS OR OWL MONKEYS—General Description of the Family—Peculiar Formation of the Arm-bone—THE THREE-STRIPED OWL MONKEY—Described by Humboldt and Bates—THE RED-FOOTED DOUROUCOULI—THE SAKIS—Remarkable Resemblance in the Face to Man—Structural Peculiarities—THE COUXIO—THE PARAUACU—THE MONK—Description of the Brain—Other Varieties of the Sakis—Anecdotes of them—THE BLACK-HEADED SAKIS—General Description.

NONE of the remaining groups or genera of these Monkeys of the New World have tails by which they can hang on with, or by the aid of which they can swing or cling when falling. Some kinds may curl the tail around a bough, or use it in their rapid side movements, after the manner of other animals, but it is never truly prehensile.

This deficiency in the prehensile capacity of the tail is, of course, accompanied by an absence of the elaborate tail structures, and the end bones especially are no longer flattened, so as to grasp easily, but are round.

There are other signs of their having a less elaborate conformation than the prehensile-tailed; thus, the front teeth project, or are prominent obliquely in all but one genus, and the feet and hands resemble those of quadrupeds more than ever. In fact, having descended the scale of Monkeys nearly to the bottom, resemblances with the next groups of animals are becoming more and more apparent. Just as the Monkeys of the Old World—the Baboons—resemble the carnivorous animals in many points, so these non prehensile-tailed Monkeys of the New World have many likenesses with the Lemuroida, and with insect-eating animals, and the smaller they are the greater is the resemblance. There are two divisions of the Monkeys without prehensile tails. In one, the species have the same number of teeth as Myctes and Ateles; and in the other they have only thirty-two teeth.

In the first division are the Squirrel Monkeys, the Sakis, and the Douroucoulis, forming respectively the genera Callithrix, Pitheeia, and Nyctipithecus; and in the second there are the Marmosets and Tamarins, of the genera Hapale and Midas. The second division is distinctly separated from the other by some comparative anatomists, and forms the group of "Arctopitheci," or Bear Monkeys.

GENUS CALLITHRIX*—THE SAIMARIS.

Callithrix means lovely hair, from Κάλλος and θρίξ, and merely refers to the pretty fur of these Monkeys, and gives no insight into their peculiarities, and is a mere name. It includes the Squirrel Monkeys, which are distinguished by having good-sized canine teeth, and by the first crushing tooth

* This genus is sometimes divided into two—*Callithrix* and *Chrysothrix*.

being conical in shape, and having an extra tubercle on its base; on the other hand, there are other kinds in it which have short canine teeth, such as the Widow Monkey.

All have the peculiarities of the non prehensile-tailed group, but their front teeth do not project forwards. The tail is round and slender.

THE SQUIRREL MONKEY.*

Buffon was a great admirer of this long-tailed, very human-headed little Monkey, and remarked that they will always be admired more than any other of their American brethren, on account of their littleness, the gentleness of their movements, their brilliant colour, their large and striking eyes, and their little round faces. He noticed that although the tail was long it was not stout and muscular, as is the case in those which are prehensile; and he observed that they were fond of curling it around objects, and even around their own or their mate's bodies. Their grey olive body-fur contrasts with their bright red arms and legs, whilst the muzzle is blackish, and these colours, on an active little creature whose body is about ten inches long, and whose tail is not quite fourteen, look very pretty.

Humboldt often had the opportunity of watching the Saimaris, and was much impressed with their affectionate disposition, and says that they readily wept if they were spoken to in a sad manner. When they are spoken to for some time they will listen with great attention, and then will place their little hands to the speaker's lips. The attempt suggests the great trouble to catch the words as they come out of the mouth. They knew objects when they saw them in pictures, and even when they were not coloured, and when they represented their usual food, such as fruit and insects, they endeavoured to catch hold of them. They entertained a great desire to catch Spiders, and caught them with great skill, either with their hands or mouths.

They feel any sudden change in the temperature of their native woods very soon, and when there is a fall of some degrees in the thermometer, they collect in little troops, and huddle together for the sake of their mutual warmth. There is a vast deal of squabbling and fighting to see who shall get in the middle, and not be left out in the cold, and great is the whistling and squeaking. Unfortunately for the noisy creatures, the Indian hunters take advantage of their assembling in this manner, for when they hear the cries they shoot their arrows in the direction of the Monkeys, and often hit the chilly little group. It is said that when young they have a slight smell of musk.

The Squirrel Monkeys have a small face, and the brain case behind it is moderately arched above, and sticks out behind very decidedly. This is because the head is placed on the spine differently to the Monkeys already described. In them the opening in the under part of the skull, for the passage of the spinal cord (the foramen magnum) is far back, but in the Squirrel Monkeys it is much further forward; so far forward, indeed, that there is enough room for brain matter behind it as to allow the back part of the brain to be relatively larger than in man. Huxley remarks that in this Monkey the cerebral hemispheres (that is to say, the whole of the "brain proper") project beyond the cerebellum to a greater relative extent than in any other Mammal nearly by one-fifth of their total length. But the fore part of the brain is small, and there are very few convolutions. On referring to the description of the Howlers, this great difference will be appreciated. Gervais, with a laudable desire to account for the great development of the back part of the head, insists on the great love the young show their mother, not leaving her even when she is dead. The orbits of this Monkey are large, and are close together; they are not perfectly separated by bone, for a membrane shuts one off from the other; and the cheek-bone has not the round hole in it which is observed in the Spiders and Howlers. As a whole, the head is very human-like, especially when it is young; but the forehead-bone is triangular, and projects upwards and backwards between the side bones of the head, and the chin is round and prominent. The forehead is narrow, and the muzzle is more protruding, however, than in man.†

Le Vaillant, in his introduction to his first voyage, gives the following curious instance of the exhibition of their instinct of clinging to their mother under extraordinary circumstances:—When living in

* *Callithrix Sciurea.*

† It appears to be a long-backed little thing, and this is not because it has more rib-bearing back-bones than the Monkeys of the Old World; on the contrary, they usually number only eleven. As regards the skeleton, the hips appear to be weakly joined on to the spine and to each other by one bone, instead of there being a long and strong sacrum to unite them. The breast-bone has only four pieces between the upper one (or the manubrium), and the cartilage at the lower end.

Dutch Guiana, at Paramaribo, where he was born, and where he had already, though very young, formed a collection of insects, the future traveller and his party in one of their excursions had killed a female Monkey. "As she carried on her back a young one, which had not been wounded, we took them both along with us, and when we returned to the plantation, my Ape had not quitted the shoulders of its mother. It clung so closely to them, that I was obliged to have the assistance of a negro to disengage them; but scarcely was it separated from her, when, like a bird, it darted upon a wooden block that stood near, covered with my father's peruke, which it embraced with its four paws, nor could it be compelled to quit its position. Deceived by its instinct, it still imagined itself to be on the back of its mother, and under her protection. It seemed perfectly at ease on the peruke. I resolved to suffer it to remain, and to feed it there with Goat's milk. It continued in its error for three weeks, but after that period, emancipating itself from its own authority, it quitted the fostering peruke, and by its amusing tricks became the friend and favourite of the whole family;" though it is difficult to suppress a smile at the idea of a Monkey clinging to a full-bottom on a wig-block, and fancying it its mamma. The story, as it begins mournfully with the slaughter of the poor mother, ends tragically for her unhappy offspring. It died a terrible death—the result, indeed, of its own mischievous voracity, but in agonies frightful to think of. "I had, however," continues Le Vaillant, "without suspecting it, introduced the wolf among my flock. One morning, on entering my chamber, the door of which I had been so imprudent as to leave open, I beheld my unworthy pupil making a hearty breakfast on my noble collection. In the first transports of my passion I resolved to strangle it in my arms; but rage and fury soon gave place to pity, when I perceived that its voraciousness had exposed it to the most cruel punishment. On eating the Beetles it had swallowed some of the pins on which they were fixed, and though it made a thousand efforts to throw them up, all its exertions were in vain. The torture which it suffered soon made me forget the devastation it had occasioned. I only thought of affording it relief; but neither my tears, nor all the art of my father's slaves, whom I had called from all quarters with loud cries, were able to preserve its life."

THE WIDOW MONKEY.*

The Monkeys in the second division of this genus have the canine teeth not so long as in the other, and the two middle upper incisors are broad. It contains the Widow Monkey.

This rare and pretty little animal has been compared, and not unaptly, to a diminutive black Dog with a white face. Its whole colour, in fact, is of a uniform shining blackness, with the exception of the face, neck, and arms, which are dull white, the former being surrounded with a narrow band of pure white. This remarkable disposition of colour has obtained for it, from the Creoles, the fanciful name of Widow Monkey, the whiteness of the face, neck, and arms being compared to the veil, handkerchief, and gloves worn in its native country by widows. It is described as particularly gentle and timid, except when a small bird—its natural food—is placed in its sight; it then becomes animated and eager, darts at it like a Rat, and devours it in an instant; at other times it will remain motionless for hours, attentively watching whatever is going on. It seems, however, to have a particular aversion to its hands being touched, since they are immediately withdrawn, and hid under its belly. It evinces a great dread of other Monkeys, but not those of its own species. Of its native history we are entirely ignorant. The usual length of the body is not more than one foot. The head is round, the muzzle short, and the general expression of its physiognomy is agreeable. The colours we have already noticed. The nose is short and flat, and the ears are almost naked. The hands are nearly white on the outside, but black within, and the hinder hands, or more properly feet, are entirely black; the tail is also black, and a little longer than the body. Very probably this pretty Monkey is only a variety of Callithrix Amictus, which has a blackish-brown fur, with the under half of its throat white, and the hands are of a dull yellow or whitish colour.

THE ONAPPO.†

This Monkey belongs to the same division of the genus as the Widow Monkey, and it is interesting because its habits are nocturnal. It feeds and roams by night instead of by day. Doubtless

* *Callithrix lugens.* † *Callithrix discolor.*

many other kinds do so, but it has been recorded of this species from its first discovery. They live in Para, and in the Brazils, and are remarkable for the agile and graceful way in which they jump from tree to tree, the females carrying the little ones on their backs, and moving with the vivacity and restlessness of birds. Resting during the day, they roll themselves up like balls, and utter plaintive, deep-seated, weary cries, which have given them the name of Ventriloquist Monkeys. At night they

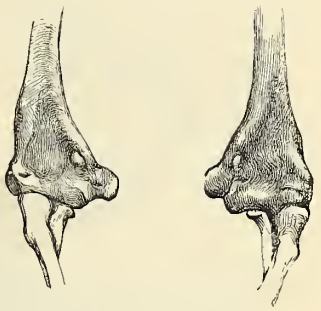
THE CALLITHRIX AMICTUS.

are all life and movement, and then they search for insects and eggs, and enjoy themselves. Their colour is a reddish-grey, and spotted on the upper parts of the body, and beneath and on the limbs the tint is of a vivid maroon. The tail is grey, tipped with white. There are fourteen species of the genus, and they range to the southern limits of the great forests.

GENUS NYCTIPITHECUS—THE DOUROUCOULIS—THE OWL MONKEYS.

The name given to these Monkeys conveys their habit of sleeping by day, waking up in the evening, and leading a very restless life during the greater part of the night. They are small animals,

with a large round head, short face, and very large eyes; their fur is kept close; they have a tail of some length, but it can only curl around objects without holding on. The body is short, and greatly resembling that of the Squirrel Monkey in some points. They are distinguished as follows:—The two middle upper front teeth (incisors) are broad, and the lower ones project in a slanting direction; the canines are moderately long. The ears are partly hidden amongst the hair of the head, and the eyes are large. There is a curious condition of the upper arm-bone (humerus) of these Monkeys, which they have in common with the different kinds of Cebus, the Squirrel Monkeys, and the little Ouistitis about to be mentioned. It is, moreover, seen in the Carnivora, or the flesh-eating animals. The lower part of the bone, where it is jointed to the two bones of the fore-arm, at the elbow, has one of its projections there (the inner condyle) perforated by a hole. This gives passage to the main artery of the limb and the main nerve, and the use of it appears to be to prevent the contracting muscles of the arm pressing upon these important structures. They resemble some of the lower animals, especially one of the Lemuroida, of the genus Stenops, in the length of the loin back-bones; and, indeed, relatively this lumbar region is longer in them than in any other Monkey. The rib-bearing back-bones are more numerous than in other Monkeys, and there are either fourteen or fifteen of them, and, moreover, their spines are much prolonged forwards, as in carnivorous quadrupeds.



ARM-BONE OF OWL MONKEY.

THE THREE-STRIPED OWL MONKEY.*

This is another of the interesting objects first made known to us by the researches of M. Humboldt, who described it as one of the most remarkable Monkeys of South America. According to the account of this well-known traveller, its habits are completely nocturnal, as it wanders about only during the night, and retires into hollow trees, or rather recesses, to sleep away the day. In captivity it generally composes itself to rest at nine in the morning, and continues in that state until seven in the evening; if, during this period, it is awakened, it becomes melancholy, listless, and stupid, and seems to have much difficulty in opening its large, owl-like eyes. M. Humboldt's figure represents the animal dormant. No sooner, however, does the setting sun bring the return of twilight, which to him is his "opening day," than our little Monkey becomes all life and impetuosity. He then commences his hunt (if unconfined) after small birds, insects, and probably fruits, since he shows no objection to the latter aliment when in captivity. This carnivorous disposition may probably account for the extreme difficulty with which this species is tamed. An individual in the possession of the traveller, and which he kept for nearly five months, could not be reconciled to captivity. It slept during the day, hiding itself in the darkest recess it could find. It seldom played with its master, but showed particular cleverness in capturing flies, and, if irritated, it hissed and struck with its paw like a Cat, the throat being at the same time inflated. Its voice, for so small an animal, is extremely powerful; at times it is described as faintly resembling the howl of the American Tiger, or Jaguar; and at others to be a kind of mew, accompanied by a disagreeable guttural sound. The hair is grey, mixed with white, and glossed with a silvery lustre. The centre of the back is marked by a brown line, and on the head and forehead are three others, diverging, and of a black colour. The chest, belly, and under surface of the limbs are yellowish-orange. The face resembles that of a Cat, and is covered with blackish hairs. The eyes are very large, and the ridges of a bright yellow. The tail is bushy, and half as long again as the body, which measures nine inches and a half.

Mr. Bates is quoted in the following passages with reference to this and other kinds of Nyctipitheci, and their resemblances:—

"An interesting genus of Monkeys, found near Ega, are the Nyctipitheci, or Night Apes, called Ei-á by the Indians. Of these I found two species, closely related to each other, but nevertheless quite

* *Nyctipithecus trivirgatus.*

distinct, as both inhabit the same forests, namely, those of the higher and drier lands, without mingling with each other, or intercrossing. They sleep all day long in hollow trees, and come forth to prey on insects and eat fruits only in the night. They are of small size, the body being about a foot long, and the tail fourteen inches, and are thickly clothed with grey and brown fur, similar in substance to that of the Rabbit. Their physiognomy reminds one of an Owl, or Tiger-Cat. The face is round, and encircled by a ruff of whitish fur; the muzzle is not at all prominent. The mouth and chin are small, the ears are very short, scarcely appearing above the hair of the head. The eyes are very large, and yellowish in colour, imparting the staring expression of nocturnal animals of prey. The forehead is whitish, and decorated with three black stripes, which in one of the species (*Nyctipithecus trivirgatus*)

THE RED-FOOTED DOUROUCOULI. (From the *Proceedings of the Zoological Society.*)

continue to the crown, and the other (*N. felinus*) meet on the top of the forehead. *N. trivirgatus* was first described by Humboldt, who discovered it on the banks of the Cassiquiare, near the head waters of the Rio Negro. One cannot help being struck by this curious modification of the American type of Monkeys, for the Owl-faced Night Apes have evidently sprung from the same stock as the rest of the Cebidæ, as they do not differ much in all essential points from the Whaiapurais (*Callithrix*), and the Sia-miûs (*Chrysothrix*). They have nails of the ordinary form on all their fingers, and semi-opposable thumbs; but the molar teeth, contrary to what is usual in the Cebidæ, are studded with sharp points, showing that their food is principally insects. I kept a pet animal of the *N. trivirgatus* for many months, a young one being given me by an Indian companion, as a present from my newly-baptised godson. These Monkeys, although sleeping by day, are aroused by the least noise, so that when a person passes by a tree on which a number of them are concealed, he is startled by the sudden apparition of a group of little striped faces crowding a hole in the trunk. It was in this way that my companion discovered the colony from which the one given to me was taken. I was obliged to keep my pet chained up; it therefore never became thoroughly familiar. I once saw, however, an individual of

the other species (*N. felinus*), which was most amusingly tame. It was as lively and nimble as the Cebi, but not so mischievous, and far more confiding in its disposition, delighting to be caressed by all persons who came into the house ; but its owner, the municipal judge of Ega (Dr. Carlos Mariani), had treated it for many weeks with the greatest kindness, allowing it to sleep with him at night in his hammock, and to nestle in his bosom half the day as he lay reading. It was a great favourite with every one, from the cleanliness of its habits and the prettiness of its features and ways. My own pet was kept in a box, in which was placed a broad-mouthed glass jar. Into this it would dive, head foremost, when any one entered the room, turning round inside, and thrusting forth its inquisitive face an instant afterwards to stare at the intruder. It was very active at night, venting at frequent intervals a hoarse cry, like the suppressed barking of a Dog, and scampering about the room, to the length of its tether, after Cockroaches and Spiders. In climbing between the box and the wall, it straddled the space, resting its hands on the palms and tips of the outstretched fingers, with the knuckles bent at an acute angle, and thus mounted to the top with the greatest facility. Although seeming to prefer insects, it ate all kinds of fruit, but would not touch raw or cooked meat, and was very seldom thirsty. I was told by persons who had kept these Monkeys loose about the house, that they cleared the chamber of Bats, as well as insect vermin. When approached gently, my Ei-á allowed itself to be caressed, but when handled roughly it always took alarm, biting severely, striking out with its little hands, and making a hissing noise like a Cat. As already related, my pet was killed by a jealous Caiarára Monkey, which was kept in the house at the same time."

THE RED-FOOTED DOUROUCOULI.*

This night-loving Monkey has short hair, and a cylindrical tail, and looks like one of the Lemurs. It has rufous hands and feet, the ear-conchas are large and prominent, and almost hairless. It inhabits Nicaragua.

Another species† is quite nocturnal in its habits, coming out after dark only in search of food in the Peruvian valleys.

THE SAKIS.‡

Humboldt was much impressed with the resemblance of some of these Monkeys in the face to man. One of them, the Capuchin of the Orinoco, is certainly strangely human in its appearance. The eyes have, according to Broderip, a mingled expression of melancholy and fierceness. There is a long, thick beard, and as this conceals the retreating chin, the face and forehead are much upon a line. Strong, active, and fierce, he is tamed with the greatest difficulty, and when angered he raises himself on his hinder extremities, grinds his teeth in his wrath, and leaps around his antagonist with threatening gestures. "If any malicious person wishes to see this Homunculus," writes that entertaining author, "in a most devouring rage, let him wet the Capuchin's beard, and he will find that such an act is an unforgivable sin." It is so anxious not to wet this fine ornament to its face, that instead of putting the mouth to the stream when it desires to drink, it lifts the water in the hollow of its hand, inclines its head on its shoulder, and, carrying the draught to its mouth, drinks slowly, and with deliberation. This Saki is called *Pithecia cheiropotes* (the Hand-drinking Monkey). Its length, including the bushy tail, is about two feet nine inches. It is of a brownish-red colour, and the hair of the forehead is directed forwards. The body hair is long, and the beard, which arises below the ears, is brown, inclining to black, and it covers the upper part of the breast. The back is red, the eyes are sunken, and the nails are, with the exception of those of the thumbs, more like claws. They are very solitary, and often are found without their mates.

This Saki has, in common with many others, certain structural peculiarities which group them all in the genus *Pithecia*. For instance, the incisor or front teeth are rather prominent obliquely, and the lower are long. The canine teeth are long, thick, and cone-shaped. The crushing, or molar teeth, are small. The tail is very hairy, and the ears are large. The ribs are broader relatively in this genus than in any other of the Monkeys.

* *Nyctipithecus rufipes.* † *Nyctipithecus oscryi.* ‡ *Pithecia.*

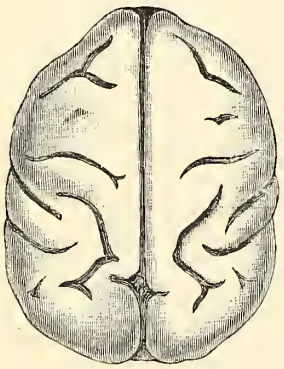
As has already been noticed, the tail differs in length in different members or species of this genus, and consequently it has been divided into a long-tailed and a short-tailed set. The Monkey just mentioned belongs to the long-tailed series, as does also the following :—

THE COUXIO.*

This Saki has a beard under its chin, and the fur is generally of a brown-black in the male, and brown in the female. It has a fine fiery tail, and a very human aspect. The name is by no means satisfactory, especially as by a curious mistake the young ones have been called "Israelites."

THE PARAUACÚ—THE HAIRY SAKI.†

Bates gives the following description of this Monkey, whose habits he studied on the Upper Amazon, at Ega :—"One of the Ega Monkeys is called the Parauacú, and is a timid, inoffensive creature, with a long bear-like coat of harsh speckled-grey hair. The long fur hangs over the head, half concealing the pleasing, diminutive face, and clothes also the tail to the tip, which member is well developed, being eighteen inches in length, or longer than the body. The Parauacú is a very delicate animal, rarely living many weeks in captivity; but any one who succeeds in keeping it alive for a month or two gains by it a most affectionate pet. One of the specimens of *Pithecia albicans*—which is only a variety of this species—now in the British Museum was, when, living, the property of a young Frenchman, a neighbour of mine at Ega. It became so tame in the course of a few weeks that it followed him about the streets like a Dog. My friend was a tailor, and the little pet used to spend the greater part of the day seated on his shoulder, whilst he was at work on his board. It showed, nevertheless, great dislike to strangers, and was not on good terms with any other member of my friend's household than himself. I saw no Monkey that showed so strong a personal attachment as this gentle, timid, silent little creature. The eager and passionate Cebi seem to take the lead of all the South American Monkeys in intelligence and docility, and the Coaita has perhaps the most gentle and impressible disposition; but the Parauacú, although a dull, cheerless animal, excels all in this quality of capability of attachment to man. It is not wanting, however, in intelligence as well as moral goodness, proof of which was furnished one day by an act of our little pet. My neighbour had quitted his house in the morning without taking the Parauacú with him, and the little creature having missed its friend, and concluded, as it seemed, that he would be sure to come to me, both being in the habit of paying me a visit daily together, came straight to my dwelling, taking a short cut over gardens, trees, and thickets, instead of going the roundabout way of the street. It had never done this before, and we knew the route it had taken only from a neighbour having watched its movements. On arriving at my house and not finding its master, it climbed to the top of my table, and sat with an air of quiet resignation waiting for him. Shortly afterwards my friend entered, and the gladdened pet then jumped to its usual perch—on his shoulder."



BRAIN OF MONK.
(From the *Proceedings of the Zoological Society.*)

THE MONK.‡

This Monkey is introduced here with a view of explaining the general characteristics of the brain of the group.

The brain of one of these Monkeys weighed 460 grains, or the one-eighteenth part of an entire but emaciated body. The general form is a regular arch, and the cerebellum is covered by the brain proper. Its general form is like some of the Cebi, and is less pointed than that of the Old World Apes in front; and is less elongated and depressed than those of the lowest Monkeys of the New World, such as the Marmosets and Tamarins, for instance.

* *Pithecia satanas.* † *Pithecia hirsuta.* ‡ *Pithecia monachus.*

On the outer surface of the brain there are a few but deeply-cut and characteristic furrows. The fissure of Sylvius slopes backwards and upwards, but not very far back, and ends abruptly. On the front lobe there is a deeply-marked fissure, running crossways, backwards, and outwards, and bent in the middle. Separated from this by a wide interval is the fissure of Rolando. The external perpendicular fissure so common in the Old World Monkeys is just visible. On the inner surface the sulci are present in a simple form, and the calcarine sulcus is well curved, and prolonged and bifurcated. This is evidently a better organised brain than that of the Howler, and is not unlike that of the Spider Monkey.

THE MONK. (From the *Proceedings of the Zoological Society.*)

The second series of the Sakis, or those with only a short tail, or a stump of three inches in length, are called Brachyures, from this peculiarity.

THE SCARLET-FACED, OR WHITE-SKINNED SAKI. THE UAKARI, AND THE BALD-HEADED BRACHYURE, OR SAKI.*

These are the names of a rare Monkey, which Bates described as follows:—"Early one sunny morning, in the year 1855, I saw in the streets of Ega a number of Indians, carrying on their shoulders down to the port, to be embarked on the Upper Amazon steamer, a large cage, made of strong lianas, some twelve feet in length and five in height, containing a dozen Monkeys of the most grotesque appearance. Their bodies (about eighteen inches in height, exclusive of limbs) were clothed from neck to tail with very long, straight, and shining whitish hair. Their heads were nearly bald, owing to the very short crop of thin grey hairs, and their faces glowed with the most vivid scarlet hue. As a finish to their striking physiognomy, they had bushy whiskers of a sandy colour, meeting under the chin, and

* *Pithecia, or Brachyurus calvus.*

reddish-yellow eyes. They sat gravely and silently in a group, and altogether presented a strange spectacle. These red-faced Apes belonged to a species called by the Indians Vikarof, which is peculiar to the Ega district, and they had been obtained with great difficulty in the forests which cover the low lands, near the principal mouth of the Japura, about thirty miles from Ega. It was the first time I had seen this most curious of all the South American Monkeys. I afterwards made a journey to the district inhabited by it, but did not then succeed in obtaining specimens; before leaving the country, however, I acquired two individuals, one of which lived in my house for several weeks.

"The Scarlet-faced Monkey lives in forests which are inundated during a great part of the year.

THE COUXIO. (From the *Proceedings of the Zoological Society.*)

It is never known to descend to the ground; the shortness of its tail is therefore no sign of terrestrial habits, as it is in the Macaques and Baboons of the Old World. It differs a little from the typical Cebidæ in its teeth, the incisors being oblique, and in the upper jaw converging, so as to leave a gap between the outermost and the canine teeth. Like the rest of its family, it differs from the Monkeys of the Old World, and from man, in having an additional grinding tooth (pre-molar) on each side of both jaws, making the complete set thirty-six, instead of thirty-two, in number. This Uakari (*Brachyurus calvus*), also called the White Uakari, from its skin, seems to be found in no other part of America than the district just mentioned, namely, the banks of the Japura, near its principal mouth; and even there it is confined, as far as I could learn, to the western side of the river. It lives in small troops amongst the crowns of the lofty trees, living on fruits of various kinds. Hunters say it is pretty nimble in its motions, but is not much given to leaping, preferring to run up and down the larger boughs in travelling from tree to tree. The mother, as in other species of the Monkey order, carries her young on her back. Individuals are obtained alive by shooting them with the blow-pipe, and arrows tipped with diluted Urari poison. They run a considerable distance after being pierced, and it requires an experienced hunter to track them. He is considered the most expert who can keep pace with a wounded one, and

catch it in his arms when it falls exhausted. A pinch of salt (the antidote to the poison) is then put in its mouth, and the creature revives. The species is rare, even to the limited district which it inhabits. Senikor Chrysostomo sent six of his most skilful Indians, who were absent three weeks before they obtained the twelve specimens already noticed. When an independent hunter obtains one, a very high price (thirty or forty milreis—£3 7s. to £4 13s.) is asked, these Monkeys being in great demand for presents to persons of influence down the river. Adult Uakaries caught in the way just described very rarely become tame. They are peevish and sulky, resisting all attempts to coax them, and biting any one who ventures within reach. They have no particular cry, even when in their native woods. In captivity they are quite silent. In the course of a few days, or weeks, if not very carefully attended to, they fall into a listless condition, refuse food, and die. Many of them succumb to a disease which, I supposed from the symptoms, to be inflammation of the chest or lungs. The one which I kept as a pet died of this disorder after I had had it about three weeks. It lost its appetite in a very few days, although kept in an airy verandah. Its coat, which was originally long, smooth, and glossy, became dingy and ragged, like that of the specimens seen in museums; and the bright scarlet colour of its face changed to a duller hue. This colour, in health, is spread over the features up to the roots of the hair on the forehead and temples, and down to the neck, including the flabby cheeks, which hang down below the jaws. The animal in this condition looks, at a short distance, as though some one had laid a thick coat of red paint on its countenance. The death of my pet was slow; during the last twenty-four hours it lay prostrate, breathing quickly, its chest strongly heaving. The colour of its face grew gradually paler, but was still red when it expired. As the hue did not quite disappear until two or three hours after the animal was quite dead, I judged that it was not exclusively due to the blood, but partly to a pigment beneath the skin, which would probably retain its colour a short time after the circulation had ceased. After seeing much of the morose disposition of the Uakari, I was not a little surprised one day at a friend's house to find an extremely lively and familiar individual of this species. It ran from an inner chamber straight towards me after I had sat down on a chair, climbed my legs, and nestled in my lap, turning round and looking up with the usual Monkey's grin after it had made itself comfortable. It was a young animal, which had been taken when its mother was shot with a poisoned arrow. Its teeth were incomplete, and the face was pale and mottled, the glowing scarlet hue not supervening in these animals before mature age; it had also a few long black hairs on the eyebrows and lips. The frisky little fellow had been reared in the house amongst the children, and allowed to run about freely, and took its meals with the rest of the household. There are few animals which the Brazilians of these villages have not succeeded in taming. I have even seen young Jaguars running loose about a house, and treated as pets. The animals that I had rarely become familiar, however long they might remain in my possession, a circumstance due, no doubt, to their being kept always tied up. The Uakari is one of the many species of animals which are classified by the Brazilians as "mortal," or of delicate constitution, in contradistinction to those which are "duro," or hardy. A large proportion of the specimens sent from Ega die before arriving at Para, and scarcely one in a dozen succeeds in reaching Rio Janeiro alive. It appears, nevertheless, that an individual has once been brought in a living state to England, for Dr. Gray relates that one was exhibited in the gardens of the Zoological Society in 1849. The difficulty it has of accommodating itself to changed conditions probably has some connection with the very limited range or confined sphere of life of the species in its natural state, its native home being an area of swampy woods, not more than about sixty square miles in extent, although no permanent barrier exists to check its dispersal, except towards the south, over a much wider space. When I descended the river in 1859 we had with us a tame adult Uakari, which was allowed to ramble about the vessel, a large schooner. When we reached the mouth of the Rio Negro we had to wait four days, whilst the Custom-house officials at Barra, ten miles distant, made out the passports for our crew, and during this time the schooner lay close to the shore, with its bowsprit secured to the trees on the bank. Well, one morning Scarlet-face was missing, having made his escape into the forest. Two men were sent in search of him, but returned, after several hours' absence, without having caught sight of the runaway. We gave up the Monkey for lost, until the following day, when he re-appeared on the skirts of the forest, and marched quietly down the bowsprit to his usual place on deck. He had evidently found the forests of the Rio Negro very different from those of the delta lands of the Japura, and preferred captivity to freedom in a place that was so uncongenial to him."

THE BLACK-HEADED SAKI.*

This, like the last, must be enumerated among the more remarkable Monkeys of the New World, from all of which it is to be immediately distinguished by the extreme shortness of the tail, a structure which would seem to make it the representative of the Baboons of the Old Continent. It is, in fact, the only one hitherto discovered in America whose tail does not exceed three inches in length. It is altogether a small species, that described by Humboldt measuring little more than one foot five inches from the head to the feet. In its adult state, however, it is described as reaching the length of another foot. Its disposition is inactive, phlegmatic, but very docile. It eats with avidity all sorts of fruits—sweet or sour. These it will seize by stretching out both hands at once, bending the back and body at

THE WHITE-HEADED SAKI.

the same time in a forward attitude. The physiognomy has a much more human expression than that of the generality of Monkeys, particularly in the face, which is naked and black. Its profile is not much unlike the Ethiopian. The head is oval, but flattened on the sides. On the eyelids, mouth, and chin there are a few stiff hairs, but the chin has no beard. The ears are large, and like those of the human subject, are naked. The fur is long, shining, and of a uniform yellowish-brown colour over the whole of the body. The fingers are much lengthened, the nails rather flat; and the tail, notwithstanding its shortness, is thick, and almost naked towards its extremity. Broderip compares its face to one of the old withered negroes, who, by great respectability of conduct, have gained their freedom. Another variety is the White-headed Saki,† of which we give an illustration.

* *Pithecia melanocephala.* † *Pithecia leucocephala.*

THE COMMON MARMOSETS.

CHAPTER XII.

THE MARMOSETS AND TAMARINS.*—1. HAPALE—2. MIDAS.

The Dentition of the Genus Hapale, or the Marmosets, or Ouistitis—The Face—The Paw-like Hands and Feet—Their Claws—The Skull and Brain, and the Nature of the Diet—THE COMMON MARMOSET—Its Habits—THE CLOAKED MARMOSET—THE GENUS MIDAS—THE TAMARINS—Their Dentition—THE NEGRO TAMARIN—Its Habits—MIDAS ARGENTATUM—DEVILLE'S MIDAS—THE SILKY TAMARIN—Notes on the Arctopithecini in general.

THE second division of the Monkeys of the New World is characterised by there being thirty-two teeth, and the tail is not prehensile. It is generally termed that of the Marmosets, or in scientific language, the Arctopithecini, a word which means Bear-Monkey. There are two genera in this division: the first is that of the Marmosets proper, or genus Hapale; and the second is that of the Tamarins, or genus Midas.

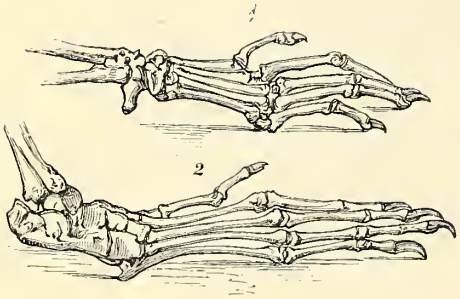
THE MARMOSETS, OR OUISTITIS.†

In this genus the thirty-two teeth are so arranged that instead of there being three back teeth, or true molars, on the side of each jaw, they have only two. But there are three false molars placed in front of these two crushing molars, and this has a direct relation to the insectivorous diet of the animal. The outer edge of these false molars has one sharp point, admirably adapted to pierce a

* *Arctopithecini.* † *Hapale.*

hard-coated Beetle, or to smash up a grub. The incisor, or front teeth, differ in the two genera. They are long (especially the lower ones), narrow, and are curved outwards, and they stick out forwards from the jaw in the genus Hapale. Those of the Tamarins are short and broad, the lower ones being stuck out and close together. The lower canine teeth of the Hapale, or Ouistitis, are very small, and those of the other genus are larger.

The face of the Marmoset is short, and the broad division between the nostrils, which open widely apart and outwards, is very evident. Very remarkable are the feet, for in these Monkeys the toe-thumb is not widely separated from the other digits, but is close to and parallel with them, so that they resemble the human foot more than the human hand. The insectivorous and carnivorous propensities of these little creatures are shown in the form of their nails, which are claws. They are curved, compressed from side to side, and sharp, except that of the great toe, which is broad. In the hand the thumb is not capable of being separated widely from the other fingers, and it has a sharp claw on it, so the resemblance to a true hand is small, and the likeness to a "paw" is great; and to conclude this part of the subject, the soles are much longer than the toes. Hence, with paws and long feet with claws, "these little creatures, which have been termed Hapale—from ἁπαλος (soft, gentle)—are not unlike Bears in their extremities, and have been called Bear-Monkeys, or *Arctopithecini*. The intelligence of these Monkeys is certainly not very great, hence the examination of their brain is sure to be interesting, for one would expect that it could not be like that of the intelligent Cebus, or even that of the Spider Monkey. The mouth appears to be large, and it really has a wide gape.



1. HAND-BONES OF MARMOSET.
2. FOOT-BONES OF MARMOSET.

First, then, the skull is remarkable for the relative size of the brain case, and the back part projects far behind. The outside of the skull is smooth and rounded, and the brow-ridges are very slight, the orbits being large. Inside, and accommodating itself to this long head, is a very long brain, whose back part projects past the cerebellum. But this is not all the unusual part of it, for instead of there being convolutions, or packings-in of the surface of the brain, it is almost smooth, the great fissures being alone marked. Here, then, is the lowest form of brain yet noticed in the Quadrumana, and it approaches to the form seen in the lower animals. What the great back part of the brain case means is hardly yet known, but if it refers to the affections it will render the story told by Broderip all the more valuable. He says that a lady kept two of these Marmosets, and that she was impressed with their great affection for each other. "They had no family, but they were very happy, and were all in all to each other. One of them unfortunately died. The other seemed to be unwilling to believe the change that had taken place, and continued to caress the body, until it became absolutely necessary to remove it. Everything was done to console the widow that its fond and distressed mistress could think of, but as soon as its mate was taken away the poor widowed creature pressed its little hands to its eyes, refused to be comforted, and remained pining in that attitude till death relieved it of its sufferings."

The teeth and claws indicate a carnivorous or insectivorous diet in these Monkeys, and the brain does not deny it, and many anecdotes may be told of their love of something alive. Every one may see the Marmosets at the Zoological Gardens making usually very successful dashes at flies with their fingers, and enjoying their tiny prey; and there is little doubt that the following story is true:—One of them, which was kept by the "Sage Femme" of the Royal Family about a hundred years since, took a great fancy to fish, and made a dash at a Goldfish he saw swimming round and round in its globe. He caught it, and ate it, so the lady observing his fondness for something lively gave him an Eel, and as the little Monkey was not more than eight or nine inches in length without his tail, this lively gift frightened him at first by twisting round his body and neck; but he soon killed it, and enjoyed the treat.

THE COMMON MARMOSET.*

These little, gentle, pretty creatures, usually so readily tamed, are made great pets of, and attract much attention in all collections of animals, and one kind has been often brought from the tropical woods of the Brazils and kept in England, so that its habits during captivity have been watched from birth until death in adult age. Many years since F. Cuvier had some of the common Marmosets born whilst under his care, and he watched them and their parents well. The young ones had their eyes open on coming into the world, and their skins were covered with very smooth hair of a deep grey colour, but which was scarcely perceptible on the tail. They instantly crept into their mother's nice warm fur, and clung on with their little hands and feet, and they attracted the intense admiration and curiosity of the father and mother, who were in the same cage. There were three little ones, and the mother indeed did not know what to do with them. Broderip suggests that what followed was because the lady Ouistiti had no experienced female friend to direct her in her first confinement. At any rate, the mother seized the first by the head, and proceeded to bite this important part of the body off, and, luckily for the other two, whilst she was thus finishing off her offspring, they managed to get to her breasts, and to begin to suck. From that moment she bestowed upon them the natural affection of a parent, and became all affection. The father was even more affectionate than the mother, and assisted most assiduously in the nursing department. The favourite position of the young ones was upon the back and bosom of the mother, and when she was tired of nursing she would come up to her mate with a shrill cry, which Broderip writes said as plainly as any one could speak, "Here, do take the children!" He immediately stretched forth his hands, and placed the little ones on his back, or under his body, where they held on whilst he carried them about, and amused them. At last they used to get hungry, and whined for their mother, who took them, and after having nursed them returned them to their "papa." In fact, the father did all the hard work, and the mother merely fed them. In this instance this domestic happiness was cut short, for the mother was weakly, no wet-nurse was to be had, and the little ones sank and died. In their native state they lead an arboreal life, and assemble in groups of six or seven, climbing up the tallest trees, and jumping from bough to bough, showing the greatest activity, like and greater than that of Squirrels. So rapidly do they move from branch to branch, and from tree to tree, that the eye fails to follow them readily. They are recognised at once by their long tuft of whitish hair, which sticks out from the side of the head, and almost hides the ears. The size of the whole animal is about that of a small Squirrel, and the tail is very long, bushy, and prettily marked with alternate rings of ash-colour and of black fur. The head is small, the eyes are gentle looking, and the nose is flat, the face being black. The fur of the body is darkish brown, with different shades of colour for each hair, which is dusky at its root, reddish in the middle, and grey at the tip. There are very different stories told regarding their intelligence and affection. Some naturalists assert that they are incapable of affection towards man, even to the hand that feeds them. Swainson says "it mistrusts all, and treats as indifferently those whom one would think it well knew and those who are strangers; neither does it show much intelligence, although it is attentive, and suspicious of everything that is passing. When under the influence of fear it strives to conceal itself, uttering a short but piercing cry; at other times it hisses." The name Ouistiti has been given to this Monkey, and the Portuguese of the Amazon districts called it the Sanglain, whilst Europeans term it a Marmoset.

THE CLOAKED MARMOSET.†

The word "humerale" is to be translated a part of the harness on the shoulders, or a graduate's cloak, according to an old Latin dictionary, and thus far a fit name has been given to a little Monkey thus noticed by Mr. Bates in his work on the Amazons:—

"I saw in the woods on one occasion a small flock of Monkeys. They belonged to a very pretty and rare species, a kind of Marmoset, I think the *Hapale humeralifer* described by Geoffroy St. Hilaire. I did not succeed in obtaining a specimen, but saw a living example afterwards in the possession of a shopkeeper, at Santarem. It seems to occur nowhere else except in the dry woods

* *Hapale Jacchus.* † *Hapale humeralifer.*

bordering the campos in the interior parts of Brazil. The colours of its fur are beautifully varied; the fore part of the body is white, with the hands grey; the hind part black, with the rump and underside deadish-tawny; the tail is banded with grey and black. Its face is partly naked, and flesh-coloured, and the ears are fringed with long hairs. The specimen was not more than eight inches in length, exclusive of the tail. Altogether I thought it the prettiest species of its family I had yet seen. One would mistake it at first sight for a kitten, from its small size, varied colours, and the softness of its fur. It was a most timid creature, screaming and biting when any one attempted to handle it. It became familiar, however, with the people of the house a few days after it came into their possession. When hungry or uneasy it uttered a weak, querulous cry, a shrill note, which was sometimes prolonged so as to resemble the stridulation of a Grasshopper."

THE TAMARINS.*

The Tamarins have the upper front teeth placed close together; and the lower, which are broad and truncated, project forwards. The lower canines are longer and larger than in the Marmosets. Living in the forests of the Isthmus of Panama, Peru, and of the Brazils, they sometimes collect in troops. They are very restless, active, and probably indulge in a very mixed diet of fruit, eggs, insects, and small birds. The smaller they are the more violent are they in their gesticulations and rage. They appear, when annoyed, bristling up their hair in a very fierce manner. They are, however, easily tamed, and are made great pets of by the natives.

THE NEGRO TAMARIN.†

Bates gives some interesting details regarding the little Midas, or Tamarin Monkeys, which he saw during his long residence on the Amazons. He writes :—

"They are small in size, and more like Squirrels than true Monkeys in their manner of climbing. The nails, except those of the hind thumbs, are long and claw-shaped, like those of Squirrels, and the thumbs of the fore extremities, or hands, are not opposable to the other fingers. I do not mean to convey that they have a near relationship to Squirrels, which belong to the Rodents, an inferior order of Mammals; their resemblance to those animals is merely a superficial one. The body is long and slender, clothed with soft hair, and the tail, which is nearly twice the length of the trunk, is not prehensile. The hind limbs are much larger in volume than the anterior pair. The *Midas ursulus* is never seen in large flocks; three or four is the greatest number observed together. It seems to be less afraid of the neighbourhood of man than any other Monkey. I sometimes saw it in the woods which border the suburban streets, and once I espied two individuals in a thicket behind the English Consul's house at Nazareth. Its mode of progression along the main boughs of the lofty trees is like that of the Squirrels; it does not ascend to the slender branches, or take wonderful flying leaps like those Monkeys whose prehensile tails and flexible hands fit them for such headlong travelling. It confines itself to the larger boughs and trunks of trees, the long nails being of great assistance to the creature, enabling it to cling securely to the bark, and it is often seen passing rapidly round the perpendicular cylindrical trunks. It is a quick, restless, timid little creature, and has a great share of curiosity, for when a person passes by under the trees along which a flock is running, they always stop for a few moments to have a stare at the intruder. In Para, the *Ursulus* is often seen in a tame state in the houses of the inhabitants. When full grown it is about nine inches long, independently of the tail, which measures fifteen inches. The fur is thick, and black in colour, with the exception of a reddish-brown streak down the middle of the back. When first taken, or when kept tied up, it is very timid and irritable. It will not allow itself to be approached, but keeps retreating backwards in a querulous humour, uttering a twittering, complaining noise, its dark, watchful eyes, expressive of distrust, observant of every movement which takes place near it. When treated kindly, however, as it generally is in the houses of the natives, it becomes very tame and familiar. I once saw one as playful as a kitten, running about the house after the negro children, who fondled it to their hearts' content. It acted somewhat differently towards strangers, and seemed not to like them to sit on the hammock which was slung in the room, leaping up, trying to bite, and otherwise annoying them. It is generally fed on

* *Midas.* † *Midas ursulus.*

sweet fruits, such as the banana, but it is also fond of insects, especially soft-bodied Spiders and Grasshoppers, which it will snap up with eagerness when within reach. The expression of countenance in these small Monkeys is intelligent and pleasing. This is partly owing to the open facial angle which is given as one of 60° ; but the quick movements of the head, and the way they have of inclining it on one side when their curiosity is excited, contribute very much to give them a knowing expression. Anatomists who have dissected species of Midas tell us that the brain is of a very low type, from there being few convolutions, the surface being as smooth as that of a Squirrel's. I should conclude, at once, that this character is an unsafe guide in judging on the mental qualities of these animals. In mobility of expression of countenance, intelligence, and general manners, these small Monkeys resemble

DEVILLE'S MIDAS. (From the *Proceedings of the Zoological Society.*)

the higher Apes far more than they do any Rodent animal with which I am acquainted. On the Upper Amazon I once saw a tame individual of the *Midas leoninus*, a species first described by Humboldt, which was still more playful and intelligent than the one just described. This rare and beautiful little Monkey is only seven inches in length, exclusive of the tail. It is named *Leoninus* on account of the long brown mane which depends from the neck, and which gives it very much the appearance of a diminutive Lion. In the house where it was kept it was familiar with every one ; its greatest pleasure seemed to be to climb about the bodies of different persons who entered. The first time I went in it ran across the room straightway to the chair on which I sat down, and climbed up to my shoulder. Arrived there it turned round and looked into my face, showing its little teeth, and chattering, as though it would say, 'Well, and how do you do?' It showed more affection towards its master than towards strangers, and would climb up to his head a dozen times in the course of an hour, making a great show every time of searching there for certain animalculæ. Isidore Geoffroy St. Hilaire relates of a species of this genus, that it distinguished between different objects depicted on an engraving. M. Andouin showed it the portraits of a Cat and a Wasp. At these it became much terrified ; whereas,

at the sight of a figure of a Grasshopper or Beetle, it precipitated itself on the picture, as if to seize the objects there represented."

MIDAS ARGENTATUM.

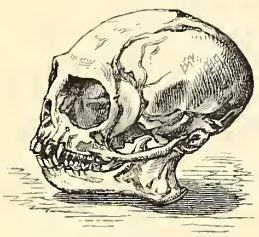
Bates is the authority for the following short notice of this pretty Monkey:—"The little Tamarin is one of the rarest of the American Monkeys. I have not heard of its being found anywhere except near Cameta. I once saw three individuals together running along a branch in a cacao grove near Cameta. They looked like white kittens. In their motions they resembled precisely the *Midas ursulus* already described. I saw afterwards a pet animal of this species, and heard that there were many so kept, and that they were esteemed as choice treasures. The one I saw was full-grown, but it measured only seven inches in length of body. It was covered with long white silky hairs, the tail was blackish, and the flesh nearly naked and flesh-coloured. It was a most timid and sensitive little thing. The woman who owned it carried it constantly in her bosom, and no money would induce her to part with her pet. She called it 'Mico.' It fed from her mouth, and allowed her to fondle it freely, but the nervous little creature would not permit strangers to touch it. If any one attempted to do so it shrank back, the whole body trembling with fear, and its teeth chattered, whilst it uttered its tremulous frightened tones. The expression of its features was like that of its more robust brother, the *Ursulus;* the eyes, which were black, were full of curiosity and mistrust, and it always kept them fixed on the person who attempted to advance towards it."

DEVILLE'S MIDAS.*

This pretty Monkey is plentiful everywhere on the Peruvian Amazons, but is extremely delicate in constitution. It will not bear the least cold, and it is kept with great difficulty. The Indian women make great pets of them, and put them into the long hair on their heads. They are thus kept warm, and are not without interesting occupation. Having become tame they frequently hop out of their odd home and feed, or having captured a Spider or two, scamper back and hide under the luxuriant crop of their owners, who are generally unwilling to part with them.

THE SILKY TAMARIN.†

This is one of the prettiest of the Tamarins, and has long silky fur and soft yellow hair. This is arranged like a mane around the neck and face, near to which its tint is redder than usual, and, to make a contrast, the face itself, and also the hands and feet, are dark purple. The beauty of the hair is very striking, and when the sun shines upon it there is a great display of colour, and a rich gloss over all. Like all the Tamarins, it has a tail about the same length as the body, which is not prehensile, but it is in this instance tufted at the end. The habits are pretty evident when the sharp, claw-like nails are examined. They are admirably adapted for seizing and killing small birds and insects, as well as for assisting the hands to hold fruit.



SKULL OF MARMOSET.

In the Brazilian forests they assemble in small parties, and, like the other Marmosets, bound from tree to tree, and keep up a great chattering and whistling, and they cry out with alarm, and soon disperse on the appearance of man within their usual haunts. This fondness for being high up in the woods is carried into their captivity, where they prefer having their little nest up at the top of the cage. In descending from this favourite spot they usually climb down backwards, the tail hanging down. They do not try to stand erect, and, indeed, the position is not natural to them.

They like to be caressed and fondled, but they give no such return, and they know those who are kind to them. They dislike strangers usually, and hiss at them. They are very delicate in Europe, as they require a constant high temperature. Cuvier states that these Monkeys have an air sac in the throat, resembling in situation that of the Spider Monkey (*Ateles paniscus*).

The Arctopithecini, as a group, have a smooth and rounded skull, large orbits, small brow-ridges, and a large brain case. The skull is large behind, and the opening for the spinal cord (foramen magnum) is at

* *Midas Devillii.* † *Midas rosalia.*

the junction of the hind third with the two fore thirds of the length of the brain. They have numerous vertebræ in their back-bone, and those in the back and loins number usually nineteen. It is stated by Cuvier that there is an air sac in the neck of the *Midas ursulus*, which communicates with the organ of voice through a space between two of its cartilages. It appears that the hands and feet of the Marmosets have thumbs and toe-thumbs so slightly separable from the fingers and toes that the resemblance to "feet" is decided. This is increased by the fact that the thumbs have claws on them, and the toe-thumb is the only digit with a flat nail, all the rest having claw-like ones. The thumb is really not opposable, but nevertheless the muscles are there to give it movement; the opponens muscle of the thumb is doubtfully present, but the adductors, abductor, and long and short flexors are all there. There is much union of the deeper muscles of the fingers, indicating less independence of movement. In the foot the toe-thumb has no special abductor, and the transversus pedis is absent.

CHAPTER XIII.

GENERAL REMARKS ON THE QUADRUMANA.

The Classification of the Monkeys of the New World—The Geographical Distribution of the Genera—The Fossil Monkeys of the New and Old World and their Alliances—The former old Fauna of Europe, Asia, and Africa—The Resemblance of Quadrumana to other Animals and Man.

With regard to the Monkeys of the New World, they are to be grouped and classified as follows:—The Howlers must be placed by themselves, then the Spider Monkeys; the Lagotriches and the Sajous form a very distinct group; and thus the prehensile-tailed series is complete. Then come the non prehensile-tailed. The Sakis form one group, and the Squirrel Monkeys, and the Night, or Owl Monkeys (the Douroucoulis), make a second. The Arctopithecini are another family, and consist of the Marmosets and Tamarins.

Family.	*Sub-Family.*	*Genus.*	*Example.*
Platyrhini, or Cebidæ	Prehensile-tailed	Mycetes	Howler.
		Ateles	Spider Monkey.
		Lagothrix	Barrigudo.
		Cebus	Cai.
	Non prehensile-tailed	Pithecia, including Brachyurus	Saki.
		Callithrix	Squirrel Monkey.
		Nyctipithecus	Douroucouli.
Arctopithecini		Hapale	Marmosets.
		Midas	Tamarins.

The American Monkeys present some remarkable instances of the localisation and dispersion of species; allied kinds of different species, but with the same habits, occupying neighbouring districts, or being rather remote. And it is noticed that the great rivers form barriers between the homes of different kinds, which, however, mingle at the river source, and in the country not rendered impassable to them by broad streams. Thus Wallace noticed that the Howler (*Mycetes Beelzebub*) is apparently confined to the Lower Amazon, in the vicinity of Para, and a black species to the Upper Amazon, the Red Ursine Howler having the Rio Negro and the Upper Amazon as its forest ground.

One Spider Monkey is found only in the Guiana district north of the Amazons, and another, the *Ateles ater*, inhabits West Brazil, but the species of the genus range, as a whole, over the forest regions from the south of Mexico to the 30° south latitude, and even on the west of the Andes.

The Lagothrix Monkeys, with their fine, furry coats, are found in the Ecuador district of the

Amazons, but are unknown in Guiana and Eastern Brazil, and the species of the short-tailed Sakis are restricted to special districts; thus the Couxio is from Guiana, and does not pass the Rio Negro on the west, or the Amazon on the south. The white-skinned one is found on the Rio Negro, and the *B. rubicundus* on the Upper Amazon, another species being found on the lower part of the same river. So it is with the other Sakis with long tails. The genus is found widely dispersed, but the species are restricted in their roaming. One is found, according to Wallace, on the north bank of the Upper Amazon, and another, with a red beard, only to the south-west of the Rio Negro. The genus Cebus has a very wide range in South America, so has the Squirrel Monkey group, for they are found on both banks of the Amazon and Rio Negro; but the white-collared species is found only on the Upper Rio Negro, and another on the Upper Amazon.

The same author noticed the range of the Douroucoulis in the Amazon districts; one (*N. trivirgatus*) is found in Ecuador, and the Cat-like kind on the Upper Amazon. Equally restricted to limited districts were three kinds of Marmosets.

Fossil remains of Monkeys have been found in the New World in the Brazils, and which belong to the existing genera Cebus, Callithrix, and Hapale. The fossil Cebus is at least four feet in height, and the Callithrix was of a very large kind. The fossil Ouistitis are large and small. The geological age of the Brazilian fossils is probably about that of the last European deposits. Now, the remarkable part of this interesting story is, that in the olden time there was the same division of the Monkeys into those of the Old and of the New World. The Catarrhini were then, as now, restricted to Europe, Asia, and doubtless to Africa; and the Platyrhini were only found in America, and moreover the resemblance of the old forms to the new is remarkable, the large size of the fossils being in keeping with what is known about the large dimensions of most of the old forms of life. Rüttemeyer's discovery in Switzerland of a fossil with bones like those of the Howler (Mycetes), and yet like a Lemur in structure, and of vast antiquity, carries us back to a time when a different distribution of animals prevailed. Then there were American-looking and Madagascar-looking things in Europe, and associated with them were Opossums and other creatures foreign enough to it at the present time. Nevertheless, this fact gives the hint of the origin of the American Monkeys from the Lemurs. Lately the fossil remains of a Lemur-like animal have been found in North America. In concluding this short notice of the extinct Monkeys, it must be remembered that in the days when there were those agreeable northern climates which made Greenland a land of flowers, Indian Monkeys lived in the dense woods of Greece, Central Europe, and Southern France.

Mr. Darwin, who has collected a vast array of facts relating to the resemblance of the Monkeys to other beings, writes very much as follows:—

"The resemblance of Monkeys to man is greatly caused by the relative position of the features of the face. The eyes are arched over; they are separated by a long nose, the end of which in some is very human. The mouth is not carried back, but occupies the same general position as in man, and the forehead, so often wrinkled, is usually prominent, and like that of a child. The likeness is increased by the fact that anger, sorrow, pleasure, and satisfaction are displayed by the Monkey by nearly similar movements of the muscles and skin, chiefly above the eyebrows, and round the mouth. Some few expressions," writes Mr. Darwin, "are, indeed, almost the same, as in the weeping of certain kinds of Monkeys, and in the laughing noise made by others, during which the corners of the mouth are drawn backwards, and the eyelids wrinkled. In man the nose is much more prominent than in most Monkeys; but," writes the same author, "we may trace the commencement of an aquiline curvature in the nose of the Hoolock Gibbon, and this in the great-nosed Monkey is carried to a ridiculous extreme." All this is disappointing to those who pride themselves on "the family nose," especially if it is a Roman. Again, the faces of many Monkeys are furnished with beards, whiskers, and moustaches. The hair grows to a great length in some species of Semnopithecus, and in the Bonnet Monkey (*Macacus radiatus*) it radiates from a point on the crown, with a parting down the middle. This is a human fashion; moreover, in this Monkey the front hair ends rather abruptly, and a downy and almost smooth-looking forehead is shown. They have eyebrows in some instances. Mr. Darwin, in carrying out his investigations into the resemblances between men and Monkeys, said he is, as, indeed, have been all anatomists, very interested regarding the hair of the limbs of those he places in comparison. "It is well known," he writes, "that the hair on our arms tends to converge from

above and below to a point at the elbow. This curious arrangement, so unlike that in most of the lower Mammals, is common to the Gorilla, Chimpanzee, Orang, some species of Hylobates, and even to some American Monkeys. It is not invariable in the same genus, for in *Hylobates agilis* the hair on the fore-arm is directed downwards, or towards the wrist, in the ordinary manner, and in *Hylobates Lar.* it is nearly erect, with only a slight forward inclination. It can," he adds, "hardly be doubted that with most Mammals the thickness of the hair and its direction on the back is adapted to throw off rain, and even the transverse hairs of the Dog's leg may serve for this end when he is curled up asleep."

Mr. Wallace remarks that the convergence of the hair towards the elbow on the arms of the Orang serves to throw off the rain when, as is the custom of this animal, the arms are bent, with the hands clasped round a branch, or over its own head. But the previously-mentioned naturalist aptly remarks

HEAD OF THE BLACK HOWLER. (From the *Proceedings of the Zoological Society.*)

that the attitude may not determine the direction of the hair; and that, on the contrary, the direction of the hair may determine the attitude. Of course the darkness of the negro makes any likeness, real or imaginary, with the Monkey, all the greater, and really the resemblance of the American Monkey—whose name (*Satanas*) indicates his ill looks—with its jet-black skin, white rolling eyeballs, and hair parted at the top of its head, to a young negro, is laughable enough.

Any one who visits the Zoological Gardens soon becomes aware that there is a great variety of expression in the eyes and muscles of the face of Monkeys, and infinitely greater in amount than in any other animals, and in some points infinitely less than in man. Mr. Darwin has collected facts, and given the result of his own observations upon the different methods of expression produced by the facial and other muscles, and the following is from his work on the expression of the emotions :—

"It is not possible to distinguish in Monkeys, at least, without more experience than I have had, the expression of pleasure or joy from that of affection. Young Chimpanzees make a kind of barking noise when pleased by the return of any one to whom they are attached. When this noise—which the keepers call a laugh—is uttered, the lips are protruded; but so they are under various other emotions.

Nevertheless, I could perceive that when they were pleased, the form of the lips differed a little from that assumed when they were angered. If a young Chimpanzee be tickled, and the armpits are particularly sensitive to tickling—as in the case of our children—a more decided chuckling or laughing sound is uttered, though the laughter is sometimes noiseless. The corners of the mouth are then drawn backwards, and this sometimes causes the lower eyelids to be slightly wrinkled. But this wrinkling, which is so characteristic of our own laughter, is more plainly seen in some other Monkeys. The teeth in the upper jaw in the Chimpanzee are not exposed when they utter their laughing noise, in which respect they differ from us; but their eyes sparkle and grow brighter, as Mr. W. L. Martin, who has particularly attended to their expression, states.

"Young Orangs when tickled likewise grin and make a chuckling sound, and Mr. Martin says that their eyes grow brighter. As soon as their laughter ceases, an expression may be detected passing over their faces, which, as Mr. Wallace remarked, may be called a smile. I have also noticed something of the same kind with the Chimpanzee. Dr. Duchenne—and I cannot quote a better authority—informs me that he kept a very tame Monkey in his house for a year, and when he gave it during meal times some choice delicacy, he observed that the corners of its mouth were slightly raised; thus an expression of satisfaction, partaking of the nature of an incipient smile, and resembling that often seen on the face of man, could be plainly perceived in this animal.

"The *Cebus azarae*, when rejoiced at again seeing a beloved person, utters a peculiar twittering sound. It also expresses agreeable sensations by drawing back the corners of its mouth, without producing any sound. Rengger calls this movement laughter, but it would be more appropriately called a smile. The form of the mouth is different when either pain or terror is expressed, and shrill shrieks are uttered. Another species of Cebus in the Zoological Gardens when pleased makes a reiterated shrill note, and likewise draws back the corners of its mouth, apparently through the contraction of the same muscles as with us. So does the Barbary Ape (*Innus ecaudatus*) to an extraordinary degree; and I observed in this Monkey that the skin of the lower eyelids then became much wrinkled. At the same time it rapidly moved its lower jaw or lips in a spasmodic manner, the teeth being exposed; but the noise produced was hardly more distinct than that which we sometimes call silent laughter. Two of the keepers affirmed that this slight sound was the animal's laughter, and when I expressed some doubt on this head (being at the time quite inexperienced), they made it attack, or rather threaten, a hated Entellus Monkey living in the same compartment. Instantly the whole expression of the face of the Innus changed; the mouth was opened much more widely, the canine teeth were more fully exposed, and a hoarse barking noise was uttered.

"The Anubis Baboon was first insulted, and put into a furious rage, as was easily done by his keeper, who then made friends with him, and shook hands. As the reconciliation was effected the Baboon rapidly moved his jaws and lips up and down, and looked pleased. Two or three species of Macacus, and the *Cynocephalus niger*, draw back their ears, and utter a slight jabbering noise when they are pleased by being caressed. With the Cynocephalus the corners of the mouth are at the same time drawn backwards and upwards, so that the teeth are exposed; hence this expression would never be recognised by a stranger as one of pleasure. The crest of long hairs on the forehead is depressed, and apparently the whole skin of the head drawn backwards. The eyebrows are thus raised a little, and the eyes assume a staring appearance. The lower eyelids also become slightly wrinkled, but this wrinkling is not conspicuous, owing to the permanent transverse furrows on the face. With Monkeys the expression of slight pain, or of any painful emotion, such as grief, vexation, jealousy, &c., is not easily distinguished from that of moderate anger, and these states of mind readily and quickly pass into each other. Grief, however, with some species, is certainly exhibited by weeping. A woman who sold a Monkey to the Zoological Society, believed to have come from Borneo (*Macacus maurus*), said that it often cried, and Mr. Bartlett, as well as the keeper, Mr. Sutton, have repeatedly seen it, when grieved, or even when much pitied, weeping so copiously, that the tears rolled down its cheeks. There is, however, something strange about this case, for two specimens subsequently kept in the gardens, and believed to be the same species, have never been seen to weep, though they were carefully observed by the keeper and myself when much distressed and loudly screaming. Rengger states that the eyes of the *Cebus azarae* fill with tears, but not sufficiently to overflow, when it is prevented getting some much-desired object, or is much frightened. Humboldt also asserts that

the eyes of the *Callithrix sciureus* instantly fill with tears when it is 'seized with fear,' but when this pretty little Monkey in the Zoological Gardens was teased so as to cry out loudly, this did not occur. I do not, however, wish to throw the least doubt on the accuracy of Humboldt's statement.

"The appearance of dejection in young Orangs and Chimpanzees when out of health is as plain and almost as pathetic as in the case of our children. Their state of mind and body is shown by their listless movements, fallen countenances, dull eyes, and changed complexion.

"This emotion is often exhibited by many kinds of Monkeys, and is expressed, as Mr. Martin remarks, in many different ways. Some species, when irritated, pout the lips, gaze with a fixed and savage glare on their foe, and make repeated short starts as if about to spring forward, uttering at the same time inward guttural sounds. Many display their anger by suddenly advancing, making abrupt starts, at the same time opening the mouth, and pursing up the lips so as to conceal the teeth, while the eyes are daringly fixed on the enemy as if in savage defiance. Some again, and principally the long-tailed Monkeys, or Guenons, display their teeth, and accompany their malicious grins with a sharp, abrupt, reiterated cry. Mr. Sutton confirms the statement that some species uncover their teeth when enraged, whilst others conceal them by the protrusion of their lips, and some kinds draw back their ears. The *Cynocephalus niger*, lately referred to, acts in this manner, at the same time depressing the crest of hair on its forehead, and showing its teeth, so that the movements of the features from anger are nearly the same as those from pleasure; and the two expressions can be distinguished only by those familiar with the animal.

"Baboons often show their passion, and threaten their enemies in a very odd manner, namely, by opening their mouths widely, as in the act of yawning. Mr. Bartlett has often seen two Baboons, when first placed in the same compartment, sitting opposite to each other, and thus alternately opening their mouths; and this action seems frequently to end in a real yawn. Mr. Bartlett believes that both animals wished to show to each other that they are provided with a formidable set of teeth, as is undoubtedly the case. As I could hardly credit the reality of this yawning gesture, Mr. Bartlett insulted an old Baboon, and put him into a violent passion, and he almost immediately thus acted. Some species of Macacus and of Cercopithecus behave in the same manner. Baboons likewise show their anger—as was observed by Brehm with those which he kept alive in Abyssinia—in another manner, namely, by striking the ground with one hand, like an angry man striking the table with his fist. I have seen this movement with the Baboons in the Zoological Gardens, but sometimes the action seems rather to represent the searching for a stone or other objects in their beds of straw. Mr. Sutton has often observed the face of the Rhesus Monkey, when much enraged, growing red. As he was mentioning this to me another Monkey attacked a Rhesus, and I saw its face redden as plainly as that of a man in a violent passion. In the course of a few minutes after the battle the face of this Monkey recovered its natural tint; at the same time that the face reddened, the naked posterior part of the body, which is always red, seemed to grow still redder, but I cannot positively assert that this was the case. When the Mandrill is any way excited the brilliantly-coloured naked parts of the skin are said to become still more vividly coloured.

"With several species of Baboons the ridge of the forehead projects much over the eyes, and is studded with a few long hairs representing our eyebrows. These animals are always looking about them, and in order to look upwards they raise their eyebrows. They have thus, as it would appear, acquired the habit of frequently moving their eyebrows. However this may be, many kinds of Monkeys, especially the Baboons, when angered or in any way excited, rapidly and incessantly move their eyebrows up and down, as well as the hairy skin of their foreheads. As we associate in the case of man raising and lowering of the eyebrows with definite states of the mind, the almost incessant movement of the eyebrows by Monkeys gives them a senseless expression. I once observed a man who had a trick of continually raising his eyebrows with any corresponding emotion, and this gave to him a foolish appearance; so it is with some persons who keep the corners of their mouths a little drawn backwards and upwards, as if by an incipient smile, though at the time they are not amused or pleased.

"A young Orang, made jealous by her keeper attending to another Monkey, slightly uncovered her teeth, and uttering a peevish noise, like 'tish-shist,' turned her back on him. Both Orangs and Chimpanzees when a little more angered protrude their lips greatly, and make a harsh barking noise.

A young female Chimpanzee in a violent passion presented a curious resemblance to a child in the same state. She screamed loudly, with widely-open mouth, the lips being retracted so that the teeth were fully exposed. She threw her arms wildly about, sometimes clasping them over her head. She rolled on the ground, sometimes on her back, sometimes on her belly, and hit everything within reach. A young Gibbon in a passion has been described as behaving in almost exactly the same manner. The lips of young Orangs and Chimpanzees are protruded sometimes to a wonderful degree under various circumstances. They act thus not only when slightly angered, sulky, or disappointed, but when alarmed at anything—in one instance at the sight of a Turtle—and likewise when pleased. But neither the degree of protrusion nor the shape of the mouth is exactly the same, as I believe, in all cases; and the sounds which are then uttered are different.

"Frowning, which is one of the most important of all the expressions in man, is due to the contraction of the corrugations by which the eyebrows are covered and brought together, so that vertical furrows are formed on the forehead. Both the Orang and Chimpanzee are said to possess this muscle, but it seems rarely brought into action, at least in a conspicuous manner. I made my hands into a sort of cage, and placing some tempting fruit within, allowed both a young Orang and Chimpanzee to try their utmost to get it out; but, although they grew rather cross, they showed not a trace of a frown, nor was there any frown when they were enraged. Twice I took two Chimpanzees from their rather dark room suddenly into bright sunshine, which would certainly have caused us to frown. They blinked and winked their eyes, but only once did I see a very slight frown. On another occasion I tickled the nose of a Chimpanzee with a straw, and, as it crumpled up its face, slight vertical furrows appeared between the eyebrows. I have never seen a frown on the forehead of the Orang.

"A fresh-water Turtle was placed, at my request, in the same compartment in the Zoological Gardens with many Monkeys, and they showed unbounded astonishment, as well as some fear. This was displayed by their remaining motionless, staring intently with widely-opened eyes, their eyebrows being often moved up and down. Their faces seemed somewhat lengthened. They occasionally raised themselves on their hind legs to get a better view. They often retreated a few feet, and then, turning their heads over one shoulder, again stared intently. It was curious to observe how much less afraid they were of the Turtle than of a living Snake, which I had formerly placed in their compartment, for in the course of a few minutes some of the Monkeys ventured to approach and touch the Turtle. On the other hand some of the larger Baboons were greatly terrified, and grinned as if on the point of screaming out. When I showed a little dressed-up doll to the black Baboon, it stood motionless, stared intently with widely-opened eyes, and advanced its ears a little forwards; but when the Turtle was placed in its compartment, this Monkey also moved its lips in an odd, rapid, jabbering manner, which the keeper declared was meant to conciliate or please the Turtle. I was never able clearly to perceive that the eyebrows of astonished Monkeys were kept permanently raised, though they were frequently moved up and down. Attention, which precedes astonishment, is expressed by man by a slight raising of the eyebrows, and Dr. Duchenne informs me that when he gave to the Monkey formerly mentioned some quite new article of food, it elevated its eyebrows a little, thus assuming an appearance of close attention. It then took the food in its fingers, and with lowered or rectilinear eyebrows scratched, smelt, and examined it, an expression of reflection being thus exhibited. Sometimes it would throw back its head a little, and again with suddenly-raised eyebrows re-examine, and finally taste, the food.

"In no case did any Monkey keep its mouth open when it was astonished. Mr. Sutton observed for me a young Orang and Chimpanzee during a considerable length of time; and, however much they were astonished, or whilst listening intently to some strange sound, they did not keep their mouths open. This fact is surprising, as with mankind hardly any expression is more general than a widely-open mouth, under the sense of astonishment. As far as I have been able to observe, Monkeys breathe more freely through their nostrils than men do, and this may account for their not opening their mouths when they are astonished, for, as can be discovered with care, man apparently acts in this manner when startled, at first for the sake of quickly drawing a full inspiration, and afterwards for the sake of breathing as quietly as possible.

"Terror is expressed by many kinds of Monkeys by the utterance of shrill screams, the lips being drawn back so that the teeth are exposed. The hair becomes crest, especially when some anger is likewise felt. Mr. Sutton has distinctly seen the face of the Rhesus Monkey grow pale from fear.

Monkeys also tremble from fear, and sometimes they void their excretions. I have seen one which, when caught, almost fainted from an excess of terror."

Rengger, who studied the American Monkeys carefully, says that they evidently understand each others' gestures, and this is evident enough to all who spend a little time in a large collection of them. They have their likes and dislikes, and submit to be teased and bullied by some favourite, although of a different species; the contrary, however, is the usual occurrence, and they resent familiarities very readily. Perhaps the most amusing instance of this fondness is given by Mr. Darwin, who had it from the Superintendent of the Gardens. Two Chimpanzees, which were rather older animals than those usually brought to England, were introduced to each other for the first time:—"They sat opposite,

YOUNG ORANGS. (*From a Sketch at the Zoological Gardens.*)

touching each other with their much-protruding lips, and the one put his hand on the shoulder of the other. They then mutually folded each other in their arms. Afterwards they stood up, each with one arm on the shoulder of the other, lifted up their heads, opened their mouths, and yelled with delight."

Mr. Bartlett, of the Zoological Gardens, states that the faculty of attention which is necessary for imitation, obedience, and teaching, is a very variable one amongst the same species of Monkeys, and told Mr. Darwin the following anecdote:—"A man who trains Monkeys to act used to purchase common kinds from the Zoological Society at the cost of five pounds for each, but he offered to give double that price if he might keep three or four of them for a few days, in order to select one. When asked how he could possibly so soon learn whether a particular Monkey would turn out a good actor, he answered that it all depended on their power of attention. If, when he was talking and explaining anything to a Monkey, its attention was easily distracted, as by a fly on the wall, or other trifling object, the case was hopeless. If he tried punishment to make an inattentive Monkey act, it turned sulky. On the other hand, a Monkey which carefully attended to him could always be trained."

Very little is known about the family habits of the Monkey, and whether they have one, two, or

many wives; but in some instances, where the colour of the male and his ornamentation differs from that of the female, it has been possible to trace their habits. Thus, the Gorilla is undoubtedly a polygamist, and the males and females differ. So it is with the Baboons, which live in troops or herds containing twice as many adult females as males. Amongst the South American Monkeys the Howler (*Mycetes caraya*) usually lives with two or three wives, and is distinguished from them by his voice, colour, and beard; and the Capuchin, which also differs from the female, is probably polygamous. The good example of having one wife set by some Monkeys is utterly lost upon some Eastern potentates. Thus, Sir John Lubbock states, that an intelligent Kandyan chief—of course a polygamist—was perfectly scandalised at the utter barbarism of living with only one wife, and never parting until separated by death. "It was," he said, "just like the Wanderoo Monkey." P. MARTIN DUNCAN.

CHAPTER XIV.

THE LEMUROIDA.

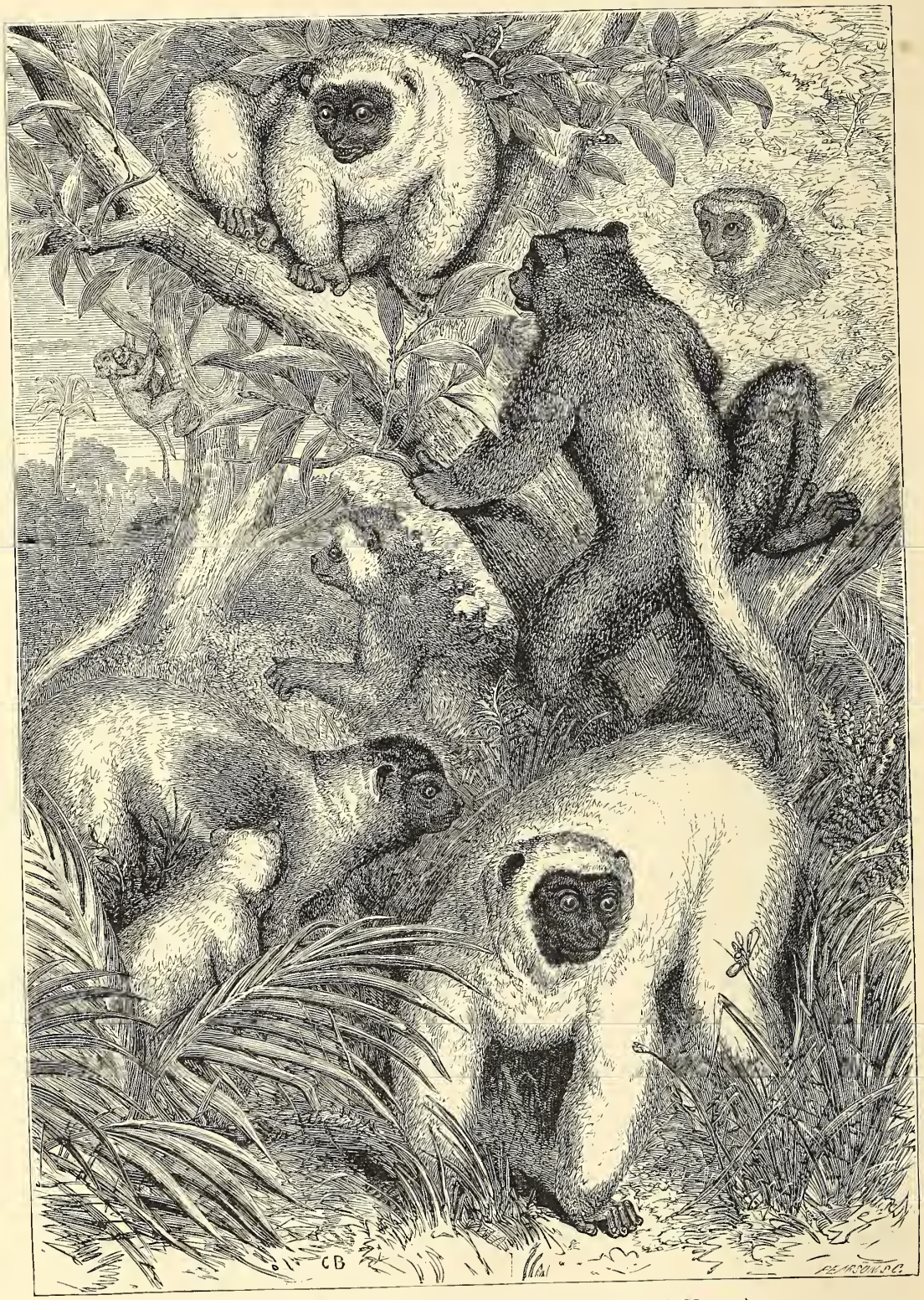
I. INDRIS.—2. LEPILEMUR HAPALEMUR.

The Name of the Genus Lemur popularly given to the Group—Lemuroida the Correct Name—Their Distinctive Characters—Their Hands and Feet—Ankle-bones—Tail—*Rete Mirabile*—Nostrils—Colour of the Eye—Ears—Teeth—Brain—Resemblance to Monkeys—Their Locality—Lemur at Liberty—Its Playfulness—Division of the Lemurs—Beauties of Madagascar—GENUS INDRIS—Described by Grandidier—Their Locality—Colour—Fingers—Teeth—THE DIADEM INDRIS—Specimens at the British Museum—Little known about it—THE WOOLLY LEMUR—Described by Sonnerat—THE SHORT-TAILED INDRIS—Distinguished by its Tail—Its Skull—GENUS LEPILEMUR—Their Teeth—Tail—THE WEASEL LEMUR—THE GREY LEMUR—Specimens obtained by Pollen—Their Cry.

THE forests of Madagascar, of Western and Eastern Africa, and of some of the Asiatic Islands, are the homes of several kinds of animals which are not unlike the Monkeys in some respects, but which differ from them in their habits of life, and, to a certain extent, in their anatomy. Most of them are in the habit of hiding up all the day, and of moving with great vivacity at dusk and during the night-time. Their gliding, noiseless motion amidst the dense foliage of the tropical woods during the dark hours, and their restless activity in searching for their food during the short twilight, were considered to resemble the fitful apparitions of sprites, spectres, and hobgoblins, and hence Linnæus gave them the name of Lemurs, taking the term from the Latin (*lemures*), "ghosts." The name has been adopted popularly, so as to include all the kinds which, with some structural resemblance to the Monkeys, are for the most part nocturnal in their habits, and it really appears to represent the notions which the excessively timid and superstitious natives of the Eastern Islands have of the malevolent influence of some of these active and very small creatures, whose large eyes glare and shine in the dark woods as they rush to and fro before the extreme darkness of the night commences. The use of the name has been productive of some confusion, for it was especially given to one genus or group of kinds which is restricted to the Island of Madagascar. The genus Lemur, with a species of which most visitors to the Zoological Gardens are familiar—the Ring-tailed Lemur—by no means contains all the animals now under consideration, and they have been arranged under other groups, or genera, and have different names; yet they are all popularly called Lemurs.

Hence, to avoid this confusion, it is usual to call the genus just mentioned genus Lemur, and all the others "Lemur-like animals," and the Greek word εἶδος (*like*) being added the term *Lemuroida* is formed. In scientific language, then, the creatures popularly called Lemurs are termed *Lemuroida*. Either expression may be used, but if the familiar one is employed, it is necessary to remember that the word means other animals besides those of the genus Lemur.

The Lemurs, using the popular term in its wide significance, can be distinguished from the Monkeys and all other animals at a glance. Very few travellers have the opportunity of observing



8 GROUP OF LEMUROIDS. (*From Specimens in the British Museum.*)

them when wild, and enjoying their liberty in their native woods, but every visitor to the Zoological Gardens in the Regent's Park may have the chance of comparing some of them with other animals. This comparison may be made readily at certain times, but not always, for only a few Lemurs care to show themselves in broad daylight, and the rest come out of their little nests in the evening. They are known by hairy "hands" at the end of the arms and legs, large furry tails, slim furry bodies, long ears, great staring eyes, and a muzzle like that of a small Fox. At night-time, when the Baboons, Macaques, Guenons, and American Monkeys are at rest and asleep, the Lemurs are awake, and rushing and jumping here and there in their limited space; but during the day-time, when the Monkey world is most giddy, with one or two exceptions the others are quiet, and if poked out into daylight look dazed and stupid, and are only too glad to get into darkness again. The exceptions to these habits are not numerous. The Night-loving Monkey of South America comes out to look about at the same time as its neighbour, the Night-loving Lemur; and the Common, or Ring-tailed Lemur, is always ready to receive food, or to be noticed in broad daylight, as it goes to bed with monkeydom in general.

The other animals with which the Lemuroida may be confounded are such as Squirrels, Weasels, Rats, Cats, and small Kangaroos. Some Lemuroida have a slight resemblance, in general shape, to some of these, and their habit of going about hopping on the hind legs tends to the general likeness; moreover, in some there are front teeth greatly resembling those of the gnawing, or Rodent animals, and in all the back teeth are somewhat like those of insect-eating animals, or *Insectivora*. But a little care will show that all these animals are sufficiently distinct so as not to be classified with the Lemuroids in the same group of the animal kingdom. The fact that the Lemuroids have large thumb-like great toes, which enable the foot to be used as a hand, is quite sufficient to distinguish them from animals with paws, and all those mentioned above.

A curious mistake was made by confounding a Lemur with the Sloth (which is never found out of South America, where also there are no Lemurs) in the diary of a correspondent to one of the most important newspapers in the world, and which was read with universal interest, and certainly with great amusement, during the Ashantee War. He wrote:—

"Sloths (!) of the two-toed variety abound in every part of the country. At night we always heard them, and much discussion did they cause. The cry is somewhat like the Nubian Hyena, and I think no evidence appeared besides this deceiving sound to prove the existence of Hyenas on the Gold Coast. It is only a monosyllable, *Ka*, repeated in scale, at longer and longer intervals as it mounts the gamut. Amongst the last octaves, the creature seems bound to burst. One listened for the final notes with ridiculous anxiety, lying awake in the still darkness. *Do*, *re*, *mi*, *fa*, *sol* passed off easily; but the *la* demanded evident exertion, the *si* exertion greater still, and so on at lengthening intervals, till one reached the octaves, which really seemed to split the beast's throat in utterance. I once heard a Sloth compass six octaves, but he generally finds his ultimatum at the third. The native story goes that the animal makes only a pitiful moaning when on the ground, but no sooner is he arrived on the tree-top than he utters this piercing cry; and therefore, as Mr. Bonnat told me, the Ashantees, a quick-witted people, call certain chiefs of theirs *cocofhoo*, or Sloth, because whilst they were small men they sang small, but they crow very loud from the 'stools' to which the king thus raised them. . . . I believe Mr. Winwood Reade shot a fine Sloth at Mansu. The only specimens I myself saw were two young ones, both captured by cutting down the tree on which they sat. They had pretty grey furs, and the same anxious wretched look common to their family. Those who still credit the old belief about Sloths—if there be any—would have been much disconcerted to observe the activity these creatures showed in running up and down the pole to which they were tied, walking head downwards, of course!"

The Lemuroida as a group have some general characters in common. Firstly, they are all Quadrumanous, and the hinder thumbs are in most very large, strong, opposable to the other digits, and capable of much movement. Furnished also with well-made thumbs on the hands, they have a great power of grasp, and of clasping boughs and large creeping plants during their active climbing and jumping. Then there are special structures on the tips of the fingers; these are flattening of the tips into disc or button-shaped pads, on the upper surface of which is the nail. The skin of these rounded tips covers a cushion of fat, and is well supplied with sensitive nerves, and hence they are not only

cushions, but extremely fine points of touch. Their use is evidently connected with the extremely agile boundings, from branch to branch, during the hours when there is little or no light. The sense of feeling, then, replaces that of sight to a great extent, and the supply of nerves is sufficient to excite the muscles of the fingers and hands, toes and feet, to hold on at the least touch; while the cushions of fat prevent the extremities from being jarred. These curious tips give a very clumsy appearance to the digits, even when they are extremely small. There is a true claw on the second digit (toe) of the foot, and nails on the other fingers and toes in some Lemuroids, but there are different arrange-

LEMUROIDS AT HOME IN MADAGASCAR. (*After Grandidier.*)

ments of the claws in others. It is noticed when several kinds of them are examined, that there is a great difference in their digits as regards their size and length, and the fourth is the longest instead of the third, as in man: but sometimes the index, or first finger, not counting the thumb, is much reduced in size, and in two forms it is very defective, and only a little knob remains to show its position; but this apparent deformity has something to do with their method of life. The thumbs are well formed, and so are the third, fourth, and fifth digits, the index being as just mentioned, and the result is to divide the hands, as it were, into two opposing portions, giving a grasp like that of the climbing birds—the Parrot, for instance. These kinds of Lemuroida creep slowly towards their prey, and clasp the branches firmly before they jump on the insect they desire to catch. Besides these peculiarities of the hands and feet, which, moreover, are supplied in every joint with tendons and muscles of great motive power, the fore-arm is capable of turning the wrist forwards or backwards, or, as it

is called, rotating, and also of bending. Again, the upper arm is loosely but firmly attached to the shoulders and neck, so as to admit of great range of motion, so what with the bending and rotation of the fore-arm, and the mobility and cushioned state of the fingers, these creatures possess a wonderful apparatus, suited for extreme action and safe holding on. The ability to rest on the hind legs and jump like a Kangaroo (see page 5), which is peculiar to some kinds, depends also upon peculiar structures. The ankle-bones are very long in these, so long, indeed, as to make the foot resemble that of a Frog when jumping more than that of any other animal. The long ankle-bone acts as part of a lever, and enables the muscles of the back of the leg to act on the foot so as to project the creature high in the air, or for many feet from one bough to another, or along the ground. There is nothing like this in the Monkeys. Now, the woolly fur of the Lemuroids, and their cylindrical woolly tails, at first sight appear to be encumbrances to an active animal which lives in the tropics, but they are all extremely chilly creatures, and love heat; moreover, it is possible that severe falls may be rendered less injurious by the deadening influence of a soft fur. The tail is a wonderful apparatus in some kinds, and barely exists in others, being, however, never prehensile even when longest and strongest. Probably it is used as a kind of adjustor of movements in rapid exercise, and certainly it is a great comfort to many, for several kinds like to curl it over their backs, or round their necks, like a sable boa, whilst they are asleep, or basking in the sun. In one kind it is supplied with a marvellous set of tendons, and, indeed, to such an extent of complexity, that it would appear that Nature had lavished mechanical appliances to every joint without any very definite use. It is remarkable that in those Lemuroida which have no tail, or barely a trace, there is a curious arrangement of the blood-vessels. The limbs in these kinds are not supplied with main arteries, and veins with long branches, but the blood-vessels form a closely-packed set of tubes of very small size. This network, in the language of science, is called a *rete mirabile* ("a wonderful network"), and so it is. Curiously enough this arrangement of the blood-vessels is found in some totally different animals, whose movements are very slow and cautious, such as the Sloths, for instance. Equally slow are the movements of some of the kinds of Lemuroida which possesses this interesting structure. It has been suggested that this novel division and subdivision of the blood-vessels tends to produce slowness of movement, and it may be said in a general way that the active Lemuroida and active animals of other orders do not have a *rete mirabile*.

HEAD OF INDRIS (PROPITHECUS) VERRAUXII, TO SHOW LEMUROID NOSTRILS. (*After Grandidier.*)

Some Lemuroids have short, and others have long muzzles, and there is great variety in the shape of the head. Evidently those with long noses have a very fine sense of smelling, and the whole of the members of the sub-order have a peculiar twist in the outside nostril, which distinguishes them from the Monkeys of both the Old and the New World. This twist was thought to be of great importance in classifying the Lemuroida in the animal scale, and they are often at the present day termed "Strepsirrhini," from the Greek words which mean curved nostril. Some scent out insects and grubs under the bark of trees, and all use this sense in searching for food by night. [illegible] are some long hairs about the upper lip and cheeks like those of a Cat, and these "smellers" are doubtless extremely sensitive to touch, and although they do not assist the sense of smelling, they help the animals in avoiding danger in their movements through the dark underwood.

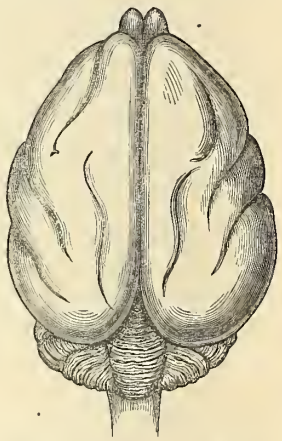
The colour of the iris (the membrane around the pupil of the eyes) is very beautiful in most, and as the eye is large and staring, it is well seen. Sometimes the pupil is round, but in some kinds it is a slit, as it is in the domestic Cat, for instance, and this shape has much to do with their noeturnal habits. The iris moves in two directions, and either makes the pupil larger or smaller; and the importance of this gift is, that whilst a small pupil only admits a very slight quantity of light into the body of the eye, a large one allows a great amount to enter; hence, at eventide the pupil dilates, or, in other words, the iris acts so as to enlarge it, and all the light possible enters, but in sunlight the pupil contracts,

even to a point, the iris moving so as to shut out the superfluous and injurious illumination. The nocturnal kinds require a very dilatable pupil, for they move often in comparative darkness, and when the least ray of light is of benefit to them. Besides this structure, there is another which has to do with husbanding, and making the most of faint light. If the eyes of a Lemur are examined a little carefully, they will be found to glare with a very metallic lustre in certain lights, just as those of a Dog and Cat. It appears that in certain animals, and in the Lemuroids, there is a peculiar layer within the eye which looks coloured, but really it is only very finely marked by fibres, which decompose the common white light into its primitive colours, in the same manner as the extremely delicate markings invisible to the naked eye on mother-of-pearl produce the well-known beautifully iridescent tints. This layer is behind the sensitive layer of the eye, and it acts as a concave reflector, collecting the slightest glimmers, and making them of use. The membrane is called the tapetum. It has been noticed that there is a difference in the expression of the eyes of the Lemuroids and Monkeys, and certainly these last have the advantage of showing their impudence, malice, and fear in their beautiful organs of sight.

EYE OF LEMUROID, SHOWING CONTRACTION AND DILATION OF PUPIL. (*Original, after Murie.*)

The ears of some Lemuroida are small, but in the majority not only are they large, but they possess singular powers of movement, and in some can be folded up. The sense of hearing is undoubtedly acute in the nocturnal kinds, and their capacious ears are of immense importance to them, for they have to discover their prey by their sense of smell and sight, and also to be on the alert against their natural enemies.

There is a singular want of sameness in the teeth of the Lemuroida, and several kinds, which apparently lead the same kinds of lives, and eat the same food, have different arrangements of the cutting and grinding teeth. Sometimes the front teeth fall out when the second set is cut, and are not replaced, and in the Aye-Aye they act as perfect chisels. As a rule, in all kinds, the lower front teeth project horizontally forwards from the jaw, and somewhat resemble in their direction those of the Marmosets, but the upper ones are straight. As the Lemuroida live easily and perform movements of very much the same character year after year, their brains are not much called upon. They are not as tractable or as intelligent as Monkeys, and although their muscles act with vigour and ease, still they are not required to perform the actions which are regulated by the superior intelligence of the Apes. Hence it is not to be expected that the brain of the Lemuroida will be as well developed as that of the Ape or Monkey. It is, in reality, not so bulky, and not so convoluted. The brain is low in height, longer than broad, and does not cover the cerebellum. Finally, the young Lemuroida are nourished within their parent through a placenta, which is diffuse, and more or less disc-shaped, and therefore unlike that of the animals already described, and of man.

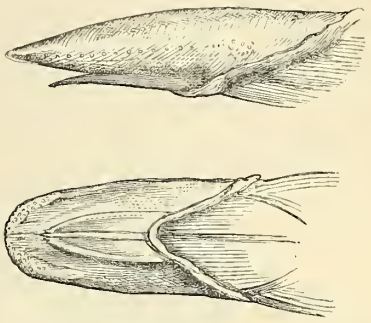


UPPER SURFACE BRAIN OF LEMUR CATTA OF NATURAL SIZE. (*Original, after Murie.*)

They have a peculiarity about the under part of the tongue, namely, beneath its tip there is a fringe of scaly flesh, the free ends of which, when the mouth is shut, fit in between the front teeth. Its use is unknown, but some have said that it is to keep the back of the teeth and the spaces between them clean.

It is their general shape, and the possession of what may be called a toe-thumb, which makes the Lemuroids resemble Monkeys, but the likeness is not with those of the Old World, but with the furry Marmosets, with long canine and projecting front teeth, of the New World. But although there are these points of resemblance, the intelligence of the Monkey is far in advance of that of the Lemur, and this can be well estimated when their eyes are compared. In the Monkey the eye is very movable, full of varying expression, and often has the aspect of supreme cunning and mischief; but this is never the case in the others, whose fixed, staring eyes have no speculation in them.

Differing as they do from the world of Monkeys, the Lemuroida still resemble them as a whole, more than they do any other animals, and therefore they are associated with them in the scheme of classification. They belong, therefore, with the Monkeys, and man, to the *Primates*, and as they present important differences from the Monkeys, they are classified in a separate sub-order of the Primates. This sub-order is called the Lemuroida, a term which has already been explained. Some zoologists, impressed with their great resemblance to the Apes, have called them the Half Apes, and others, looking upon them as the forerunners of the Monkeys, term them Pro-Simia.



SIDE VIEW AND UNDER SURFACE OF THE TONGUE OF A LEMUROID.

The Lemuroida live in very out-of-the-way places, and the majority are in Madagascar, which is an island very little visited by Europeans, and where some naturalists have studied them and their habits under great difficulties. The skins of captured specimens have been stuffed, and a few living kinds have found their way to England; hence there are some fine groups of stuffed Lemuroida in the British Museum, and some living species in the Zoological Gardens. Marvellous stories, of course, abound amongst the natives regarding their tricks and habits, and the sober truth has been very difficult to distinguish from error, especially as the night is the scene of their gaiety. Nevertheless, during the last few years much knowledge has come to hand about these interesting creatures, and it has been rendered all the more important by the labours of the comparative anatomists, who have dissected many kinds of them, and described their results.

There is no doubt that at first sight they are uninteresting. Many sleep most of the day, as a rule, and they cannot be got out of their snug little dens in the Zoological Gardens during visiting hours except by force, and then they look dazed and stupid. But a careful observation opens out much that is extremely interesting in their habits, and shows how remarkably their limbs and bodies are adapted for a singular and nocturnal life. Take an example :—Some Lemuroida, which live in Caffraria and South-eastern Africa, are called "Galagos" by the natives, and the name has been adopted by zoologists. One of these is of an uniform dark brown colour, and the tail is long, cylindrical, and woolly, the ears being large, rounded, and black, and it is called the Black, or Garnett's Galago. There is nothing to be made of its habits during the day, but if any one is affected with sleeplessness, and desires a domestic pet that would enliven the dreary midnight hours, then forthwith let them purchase a specimen, if possible a pair of them. They will rest quietly enough and contented in their berths during the day, but only let them have freedom in the chamber for a while at night, with a Cat or Dog for companion, and, *presto!* the dull hours will be merry. The following is Mr. Bartlett's (Superintendent of the Zoological Gardens) experience in a letter addressed to one of us:—"The other night I took an opportunity of letting one of these interesting creatures—Garnett's Galago—have his liberty in my room, and I assure you I was well repaid by his performance. Judge my utter astonishment to see him on the floor, jumping about *upright* like a Kangaroo, only with much greater speed and intelligence. The little one sprung from the ground on to the legs of tables, arms of chairs, and indeed on to any piece of furniture in the room; in fact, he was more like a sprite than the best pantomimist I ever saw. What surprised me most was his entire want of fear of Dogs and Cats. These he boldly met and jumped on at once, and in the most playful manner hugged and tumbled about with them, rolling over and over, hanging on their tails, licking them on the head and face. I must add, however, that now and again he gave them a sharp bite, and then bounded off, full of fun at the noise they made in consequence of the sly nip he had inflicted. This active trickery he never appeared to tire of; and I was myself so pleased on witnessing the droll antics of the creature that the night passed and it was near daybreak before I put a stop to his frolics by catching and consigning him to his cage. In bounding about on the level ground, his jumps, on the hind-legs only, are very astonishing, at least several feet at a spring, and with a rapidity that requires the utmost attention to follow. From the back of a chair he sprang, with the greatest ease, on to the table, four feet distance. He was delighted with a little wooden ball,

which he rolled about and played with for a considerable time, carrying it in one hand while he hopped and skipped about in high glee. He eats fruits, sweetmeats, bread, and any kind of animal substance, killing everything he can pounce upon and overpower. This strong and active little brute thus eats his prey at once, as I had proof in an unfortunate Sparrow which he unmercifully devoured head first."

Another pair of these Galagos, since kept in the Society's Gardens, at dusk and nightfall behave quite as actively. Most unwillingly are they poked out of their comfortable sleeping-box during the day, or even when becoming dark, until they hear the keeper sounding all visitors out, and quietness reigns. Immediately, then, they are full of life, and utter an extraordinarily loud and prolonged ka-ka-ing yell, a sort of *feu-de-joie*. From even till morn there follows unceasing motion and occasional ejaculation, until, on the appearance of the keeper, they retire to rest.

GARNETT'S GALAGO.

The number of the Lemuroida is considerable, and they have been grouped in at least twelve genera, and these, again, have been arranged in families. These will be classified by-and-by. It is extremely difficult in many instances to distinguish one kind or species from another, in consequence of the great sameness of shape, and the fact that the same individual has a different coloured coat at various times of his life, and that the males and females of the same kind are often differently coloured.

It will be seen, on reading the description of the Monkeys in the first chapters, that they can be arranged not only by their peculiar structures into grand groups, but by the particular parts of the world they inhabit. Hence they have been divided into those of the Old and of the New World. Now, something of the same kind may be done for the Lemuroida, but not quite as perfectly. There are six genera of them living in Madagascar, three in Africa, and three in the great Asiatic Islands and Hindostan. But although some of those of one locality are very distinct from those of others, it is not always so, and one Madagascar and one African group present close resemblances, and, curiously enough, two West African genera are classed close to two whose kinds live in Ceylon, Hindostan, and the island of Borneo.

No Lemuroid has ever been found in the New World, or in Australia. It will then be convenient, in order to avoid too much anatomical description, to separate at first the Lemurs geographically, and the first to be noticed are those of Madagascar.

As yet very little is known about the natural beauties of the great island of Madagascar. Very few books have been written about it, and nearly all of them are devoted to descriptions of the manners, customs, and religions of the different tribes. In fact, missionary work and political enterprise rendered the publication of such works necessary, and, with rare exceptions, the beauties of Nature, and the interesting fauna and flora, were treated with neglect.* Moreover, the jealousy of the governing powers prevented many of those travellers, who were competent to observe Nature and to appreciate her beauties, from exploring large tracts of the island. Descriptions, then, of the characteristic scenery, and of the habits of most of the animals of Madagascar, are exceedingly scarce; and, indeed, those which do exist cannot all be believed, for one geographer, whose work teems with lively anecdotes, and with illustrations of forest and upland, is stated by a later writer never to have left the eastern coast.

It appears, however, that the scenery of the great island is very varied. There is a long line of sea-coast, which is fertile in some places, but very sterile and unprofitable in the south especially. This coast-line limits the forest land, which forms a belt around the higher mountains of the central part of the country, and the hill or comparatively treeless district is broken and very romantic. Those who hunt the Lemuroida know that it is useless to seek for certain kinds everywhere; and, indeed, their experience proves that each of the different districts of the island has a peculiar little assemblage of these "Half Apes" amongst its trees. The silence amongst the woods, where the luxuriance of vegetation is extraordinary, is most remarkable. It is so different from the noise and motion within tropical forests in other parts of the world, and it is only at the end of the day, when the short twilight approaches its close, that the quiet solemnity of the scene is broken by the cries and agile movements of the various Lemuroida. The quietude is produced by the absence of the whole of the Monkey tribes from Madagascar, for they are the great noise-makers of the forests of other tropical countries, and by the indisposition of most of the Lemuroids to move by daylight. They hide themselves in nests of leaves or amongst the densest foliage, and some seek the tops of the highest trees for safety. They seem to know that the hunter will seek them by day if possible. But as the dusk approaches, the quiet, solemn-looking creatures begin to move, jump, swing, and run along the branches with a wonderful dexterity and rapidity. They rarely come to the ground, and when they do so, their gait is clumsy, but up in the trees their motions are graceful and noiseless. They cry out to each other, and appear to take a delight in disturbing the echoes of the night, and after eating their fill they become quieter towards dawn, when they retire to their hiding-places looking dazed and half-blinded by the light. Some of the kinds called *Indris*, now about to be described, illustrate these remarks very well; thus one species is only found in little patches of forest land, quite in the extreme south of the island, where the country is sandy and poor, whilst a second is found in the north-east of the island amongst the luxuriant woodland. Some keep to the districts where the bamboos abound, much to the disgust of the hunter, for the covert is thick, and the leaves very destructive to clothing. Probably it is the difficulty in trapping and shooting some kinds, and their night-life, which gives them a superior intelligence in the eyes of the natives, who hold some which are very man-like, having no tail, or only just a stump, in great veneration.

GENUS INDRIS.

The distinguished traveller of Madagascar, M. Grandidier, found it very difficult to obtain much information about these Lemuroids, the name of which is the same as a native expression of surprise, such as "Look, there it is!" He undertook a very perilous journey by sea and land to the south of the island, and there he found the favourite woods of some, and also in the south-west. He arrived in a coaster, in June, 1866, off Fort Dauphin in the south-east of the island, and being blown out to sea, gained

* An exception must now be made in favour of the "Histoire Physique, Naturelle et Politique de Madagascar," of M. Alfred Grandidier, which when completed promises to supply the want above spoken of.

the southernmost cape, St. Marie, off a most inhospitable and arid shore. A long row of sand dunes, without a trace of vegetation, bounded, in the background, a low coast-line of rocks, which extended far into the shallow sea, being constantly hidden by furious waves. Not a trace of man or of dwellings could be seen. The sand dunes slope towards the sea at a high angle, and are at least 150 yards high. Their tops are flat, and continue backwards into the country for some distance. They are composed of broken shells, and are covered here and there by a stunted spiny vegetation. It was on the slopes of these dunes that Grandidier found portions of the eggs of the extinct colossal bird Æpyornis. Beyond the dunes is a vast plain without even small hills, and covered with a scanty vegetation of groups of deformed trees ; but in the remote distance hills are seen, and then there are numerous forests.

Some species of Indris live in these stunted forests of deformed trees, in bands of ten or twelve, and never come to the ground except when pressed by hunger. When seen under such circumstances, they stand up on their hind feet, their tail hanging behind them, and they advance by little hop-like motions, resembling those of a child that jumps with its feet tied together.

They are nearly white in colour, and are called *Sifac* by the natives (page 212), and are looked upon with veneration, for they are not very unlike very small men in general shape, especially when they stand erect. In common with all the Indris, they are slim, tall, long-legged animals, with very strong feet, with a large and well-formed thumb-like opposable great toe. The head is very furry, and the ears, tufted with hair, are almost, but not quite, hidden, whilst the muzzle, moderate in length, projects between the staring eyes. They have a longish neck, and the body seems to be compressed at the sides. All the fur is soft, and stands out, and that of the tail makes it like a Fox's brush, but is more slim and cylindrical.

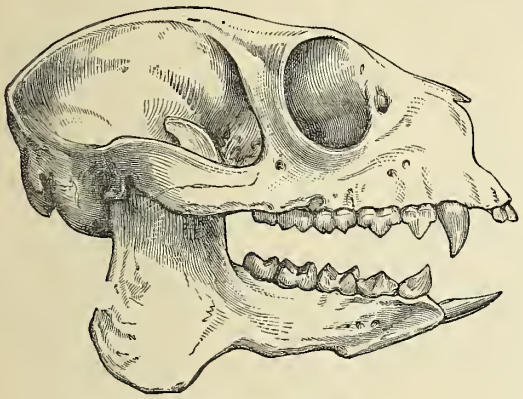
But there is a curious arrangement of the fingers, for the index finger of the hand (that is to say, the first finger, not counting the thumb) is shorter than the fifth, so that their "fore finger" is a little finger. The toe-thumb is placed widely from the toes, and rather backwardly, and the toes are united together by a kind of fold or web of the skin which reaches up to the first joint; moreover, the first toe (not including the toe-thumb) has a curved claw on it. They are not good walkers, any more than the Apes, although, like them, they assume the erect position, and it is only on very rare occasions, and when it is necessary to cross a tract of land to get to trees with more fruit upon them, that they attempt to put the foot to the ground. It is not their natural position, and they seem to be quite out of their element. When they come to the ground they rest on the outer edges of the feet, and soon drop on their hands, on the corresponding parts of which they support themselves. So walking is performed with difficulty, and not with grace, and in this they may be compared with the Orangs; but in the Indris the arms are always shorter than the legs. In the trees and branches, which are their favourite haunts, they climb easily, rapidly, and with grace, running along the boughs, jumping to great distances, and alighting with unerring certainty, and clinging on with wonderful tenacity. The structure of the muscles, bones, and ligaments enables them to lead this active arboreal existence, and so strong is their power of grasp, that it remains sometimes after death, for it has happened that in shooting them whilst clinging to the branches they have remained suspended after having been mortally wounded, or dead.

Being dwellers in the foliage of the trees, and amongst the network of branches, twigs, and creepers, the kinds of Indris have a choice of many kinds of food. Leaves, buds, fruit, insects, eggs, and small birds are constantly within their reach, but usually they do not hunt or chase prey, and are satisfied with the best fruit they can find, and other vegetable substances. Nevertheless, they do not despise or reject a bird as something out of the common way of diet, and they open the skull and suck the brains. The teeth are not very well suited for stopping and killing living prey, for in the grown-up individuals there are no lower canines, there being only an upper pair, and thus one of the most important seizing and killing arrangements is absent. On the other hand there are plenty of crushing teeth, with sharp points to them, which enable the Indris to champ fruit without much side to side movement of the jaw being permitted. There are two false, or "pre" molars on either side in both jaws, and three molar teeth behind them. Besides these there are four front teeth in both jaws. In all there are thirty teeth, a smaller number than in any of the animals yet considered.

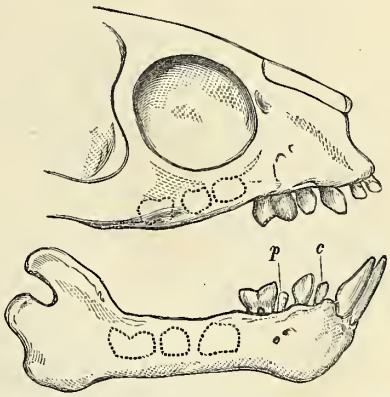
The upper front teeth, or incisors (four in number only), project forwards very slightly, and nearly bite up and down ; but the four lower front teeth (incisors) project well forwards, and the outer pair of

them are sometimes called canines, but their office is plainly the same as that of the other front teeth. The predominance of the crushing teeth (there being twenty of them) over those adapted for tearing flesh, denotes that these animals should have a vegetable diet, and this requires larger digestive organs, as the food is bulky. So it is found that the stomach is single, and then there is a very large cæcum, or blind-gut, which ends in a large intestine, which is very long, and twisted on itself, so as to form two regular folds, one on the other, instead of one, as is commonly observed in the higher animals already noticed; in fact, the arrangement is not very unlike that of the sheep, whilst the cæcum is on the same scale as that of that great vegetarian, the Rabbit. These large parts of the digestive apparatus are common to most vegetable-eating animals, whilst the flesh-eaters have them short and small.

But the Indris does not begin life with the prospect of being a vegetarian, for it has a first set of teeth, or milk teeth, as they are termed, and these are shed to make way for the second, or permanent set. Now, it is most curious that the young should have more teeth than the elders, and that were



SKULL OF BLACK INDRIS, SHOWING ADULT DENTITION.



MILK DENTITION OF INDRIS. *c*, CANINE, AND *p*, PREMOLAR, NOT REPLACED IN ADULT.

this first set to persist through life, it would indicate a very mixed feeding animal. The little ones have no less than thirty-four teeth, and they have two lower canines, and two extra lower false molars more than the adults. As age increases all these first teeth gradually fall out, and are replaced, to a certain extent, by the second set mentioned above.

Now, what is the meaning of this? Why should the young have a larger set than the adults? Clearly those of the adult are admirably adapted for its life, and it is equally evident that those of the young are of no particular use to them. They are either suckling, or are eating fruits obtained for them, and do not kill and feed on birds and living things. It is found that the milk teeth of Indris correspond with the adult or permanent set of such an animal as the Ring-tailed Lemur, which belongs to a different genus. Hence the perfect condition of the teeth of the genus Lemur are the same as the first arrangement of the teeth in the genus Indris. It tends to prove that there is some genealogical relationship between the two genera, and that they were derived from a common ancestor. Moreover, it may be assumed that the milk teeth of all animals are inherited from a perfect and adult ancestral form which was less highly organised or constituted.

It is said that the female Indris has but one little one at a time, and that they are all gentle and timid, being rarely kept for any time in captivity. They are nocturnal in their habits, and evidently have extremely sensitive vision, and, like the others which lead this life, they are protected from many jarring falls by the structure of their hands and feet.

THE DIADEM INDRIS.*

This is a fine species, with a white furry ruff, or crown, on the forehead and around the face, and it has a long muzzle and body, and a thick, long tail. It greatly resembles the White Indris, called

* *Indris diadema.*

Sifac, with the exception of its characteristic head ornament, and leads the same kind of life in another part of the island of Madagascar. Fine stuffed specimens of it, and of many other Indrisinæ, are in the British Museum, and it will be noticed that they are there called, not Indris, but Propithecus, which is another name for them. It is a question of the value of a tail in classification, which produces the two names for one genus. Some zoologists are impressed with the great importance of the tail, and do not class species together as a genus, although they may have strong resemblances,

THE DIADEM INDRIS AND THE WOOLLY INDRIS. (*After Grandidier.*)

unless they all have or have not tails. Others do not consider the possession of a tail to be of such great importance when the other characters are sufficiently close to render it advisable to form them into one group. The same question arose in considering the Monkeys, for in the genus Macacus we admitted Macaques with and without tails; and also in the genus Cynocephalus, in which there are some with good, others with small, and a few with very stumpy tails, the same caudal latitude was given. Hence, it is not consistent to form two genera of these creatures, one with a tail (or Propithecus) and the other without one, or with a stump (or Indris). Indris contains the Lemuroids, whose other resemblances are so great that they overweigh the tail question. So little is known about the Diadem Indris that it is only necessary to notice one point in its anatomy, which refers to its habits. It evidently assumes the semi-erect posture very frequently when climbing, and a great part of the weight of the body is felt by the foot, and its great clasping toe-thumb. The examination of the foot proves that it is one, and not a hand, for bone for bone it may be compared

with the human foot, and that of the Apes. The great toe is wide apart from the others, and in that it resembles the thumb of a hand; but all the other bones of the ankle or tarsus are in the same relative position as they occupy in us. They have the same names. Their foot is very broad, and this is produced by the extra size of the four front bones of the ankle, and these form an arch, the three inner ones being more or less wedge-shaped, and the outer, or fourth, is more or less of a cube in shape; hence they are called the wedge-shaped (cuneiform) and cube-shaped (or cuboid) bones. They are jointed in front to the long bones (metatarsals), and behind to the three other ankle-bones. All are

THE BLACK OR SHORT-TAILED INDRIS. (*Modified after Grandidier.*)

united more or less solidly by ligaments, and yet there is motion. Now in this Indris the wedge-shaped bones are large, especially the second from the inside, or the middle one, and curiously enough this is small in most other Lemuroids. The large arch formed by these bones contributes to the strength of the foot.

The Diadem Indris is found in the forests of the central parts of Madagascar, and appears to keep apart from other kinds and to roam about the dense woods in bands.

THE WOOLLY LEMUR—THE AVAHI.*

This is one of the long-tailed Indris, and is remarkable for having long hinder limbs, a long furry tail, a very short muzzle, and a round head.

It was first described by Sonnerat, in his voyage to the East Indies, who called it the

* *Indris laniger.*

Makis à bourre, or the Woolly Makis. On the north-east coast, the natives call this Indris the Amponghi, and this name is given to it in the great forest of Tsasifoutt, which is in the island of St. Mary, adjacent to Madagascar. This is an interesting point, for it affords evidence that the island of Madagascar had once a greater geographical extension, and that St. Mary's and the other small islands along the coast were at a former period continuous with it. These woolly Indris are not frequently caught, or indeed seen at all, for they hide during the daytime, and sleep curled up amongst the thick shade of the foliage, or in some comfortable nest in the hollow of a tree. At night-time they wake up, and eat and play amongst the trees on which their food grows. They are said to be stupid animals, but probably, as they have never had their intelligence tested except when half asleep, they may be quite as intelligent as the other Lemuroids, and this opinion is strengthened by the fact that the brain of the *Indris laniger* is large in proportion to the size of the body; larger indeed in proportion than the brain of any of the others. It is this relative size of the great organ of the nervous system which has impressed some zoologists with the propriety of placing this Indris at the head of all the Lemuroids, and nearest the Monkeys.

The animals are small in size, and a dried skin measures rather more than a foot and a half in length, from the muzzle to the root of the tail, and this latter appendage is thirteen inches long. The head is broad over the eyes, which are wide apart, and the muzzle barely projects, and the whole of the face is covered with short hairs of a reddish-brown tint. There is a distinct band of whitish fur placed across the top of the forehead, and which has fur before and behind it of a darker colour than the rest of the hair of the body. This band is curved, and forms a point which projects forward in the middle line of the forehead. The fur on the back and flanks of the body is of a dark grey colour close to the skin, but on its surface the colour is brown more or less rusty. This is the tint on the extremities, the grey colour underlying. On the backs of the thighs there are white patches, and at those spots there is no deep-seated grey tint. The cylindrical tail is reddish-brown, like the hands and feet. The ears are short and rounded, and are generally hairy, but not tufted, and they are hidden in the fur of the head. The nostrils are separated by a narrow septum. The feet are short and broad, and the claw of the toe is long and cylindrical.

Although the muzzle is so short, the teeth are set so as to be in a long row on each side, for the front cutting teeth are not placed side by side, but in front of each other, and there is a strange gap between the inner ones in the upper jaw. Then the canine teeth, only seen, of course, in the upper jaw, are very broad, and the next teeth to them (the first pre-molars) are as large as they are. This is a marked peculiarity, and there is no other creature except man that has these teeth so closely resembling each other. To complete the notice of this little highly-constructed Indris it is necessary to remark that its wrist-bones resemble in their number and place those of man and the higher Apes. The Gibbons and all the other Monkeys have an extra bone to the wrist, called the *intermedium*, and this is present in the Indris already noticed, but it is absent in this Avahi, and in the next kind about to be described.

The next species to be noticed was never included in the so-called genus Propithecus, as it has only a short stump of a tail, but has always been taken as the special illustration of the group *Indris*.

THE SHORT-TAILED INDRIS.*

This species can be distinguished from all others by its stump-like tail. It has a long muzzle, visible hairy ears, and generally speaking the fur is black; it is marked, however, with white hairs on the fore-arms, back, and hinder quarters. As regards the teeth, there is some variability in the size of the upper incisors in different individuals, and the front pair may be smaller or larger than the hind pair. The inhabitants of Madagascar call it the Babakoto (*baba* means "father," and *koto*, "boy"). This Indris, which attains the height of three feet, is found in the interior of the east of Madagascar; and when Vinson travelled through one of the great forests in that part of the island, he was constantly annoyed by the incessant noise made by numerous bands of them, which kept themselves, however, out of sight, and hidden in the dense foliage. The natives consider the Babakoto sacred, and believe that the trees on which they live yield leaves which will cure all diseases. Moreover, they tell some

* *Indris brevicaudatus.*

astonishing stories about these objects of their veneration. They say that it is dangerous to cast a spear at one of them, for, if it misses its mark, the animal returns the weapon with a surer aim! They also assert that after a little one is born, the mother throws it to the father, who is usually up a tree close by, and he throws it back again! This exercise is repeated several times; and if the young one is invariably caught it is reared with care, but if it tumbles, there is an end of it. They train the Babakoto to catch birds; and it is said that they become as useful as Dogs; moreover, it appears that, although these Indris are in the main fruit-eaters, they will not despise the brains of birds, which they suck with evident delight.

The skull of an Indris has large orbits, which are open behind into the space in which the temporal muscle works, and the "tear-canal" is in front of the orbit; moreover, the forehead, or frontal bone, is divided. The lower jaw has its angle, or the part between that which holds the teeth and that which rises up to be jointed with the skull, turned in, and the upper jaw in front is joined by the intermaxillary bones.

GENUS LEPILEMUR.

An animal which has no upper front teeth is certainly a curiosity, especially when its general state and habits resemble those of the other Indris and Lemuroids, and the Lepilemur is such a one. It is found in Madagascar, and it is interesting on account of the variable nature of the colour of the fur in different individuals, as well as from the nature of its teeth and its habits. It differs, however, so much from all the other Lemuroida, that it is placed by itself in a genus, and the distinctions are that when fully grown it has no upper front teeth, although it has them in the first, or milk set, and that it has also four teats for its young instead of two, as is the case in all the animals hitherto noticed. The name refers to its prettiness, and hence the genus is called *Lepilemur*.

This creature, considering its size, has an immense tail, as it is ten inches long, the head and trunk measuring only fourteen, and the whole animal forms a nice little meal for the natives of the north-west of the island. They call it Fitili-Ki, and as it eats the buds and leaves of trees it has a good flavour as a meat; hence it is sought after, but not hunted, for that is unnecessary. Knowing its habits the natives watch it, and, when it has left off playing and scampering about with its fellows (for it is very sociable), notice where it retires as daylight appears. There they find their prey quietly asleep, curled up in a comfortable nest of leaves, and they kill it with a stick. Hunting them would be useless, for they are quite nocturnal in their habits, and their activity in moving, and agility in taking prodigious bounds and jumps, are wonderful. Indeed, their body seems to be carefully made as strong as possible to meet the strains of their jumping, and there is a ridge of bone in the bodies of some of the vertebræ which strengthens the spine as a whole; moreover, the relation of the length of the ankle-bones and of the lower leg is that which is best adapted to their heedless rushings from branch to branch through the woods. Their nightly excursions for fruit and play are rendered all the more safe by their great eyes and widely open orbits, but how the eating the fruit is assisted by the want of the upper front teeth may probably puzzle most people. Perhaps the diet may require a greater use than is usual of the back teeth, and the lower ones are peculiar, for their front part is carried forward outside the next tooth before them in the jaw, giving thus much extra strength to the whole. This Weasel Lemur, or *Lepilemur mustelinus*, has fair-sized ears, and its colours are of all sorts of shades of red, grey, white, and yellow.

These animals hide their little ones, which do not get about much at first, in nests made in the holes in trees.

Another Lemuroid excited the attention of the members of one of the political missions, which was sent from the island of the Mauritius to the capital of the Hovas, in mountainous Central Madagascar. This animal was found in some numbers in the bamboo forests, which skirt the hills at their base, and many were caught in that of Alamazaortra. It seemed to live in the masses of bamboo leaves, and to wander about them by night, sleeping and resting by day in the deepest part of the woods. It is small, and has a short muzzle and a round head, and a long tail, the prevailing colour being grey, with red tints here and there on the back and head, and which are paler below. It is a variable species, and some individuals are more olive than grey, but all have such peculiar teeth that they can be distinguished from all others of the sub-order. They have upper and lower front teeth, but the upper set are

very small, and are so placed that the canine teeth hide the outer ones; besides this character there are four teats instead of two.

M. Pollen, a well-known naturalist, says that the natives of the north-west of Madagascar call it the Bokomboule, and in Europe it has been named the Grey or Broad-nosed Lemur, the genus being called Hapalemur, and hence its proper name of *Hapalemur griseus*. The word Hapalemur means Gentle Lemur (from ἁπαλός, soft, gentle), and this appears to be their character. Hearing of their presence in the bamboo forests, M. Pollen wished to go there to hunt them, but he was strongly urged not to do so on account of the fatigue of the sport, and the difficulties likely to arise from the spines, thorns, and

THE WEASEL LEMUR. (*After Schlegel and Pollen.*)

sharp leaves, which readily produce wounds. He went, and after being well scratched and cut about, he returned with some specimens. The Hapalemurs sleep during the whole of the day rolled up, with the back curved, and the head between the thighs, the tail being curled over the back; but they are not so sleepy that they cannot escape from the hunter who seeks them. Idle enough by day, they exhibit a wonderful agility and disposition to romp and play at night. Their cry is like the grunt of a little Pig, and the greater part of their nourishment is derived from bamboo-leaves. One, which was kept by M. Pollen in captivity, ate bananas, but would only touch rice when it was half starved, and it had the strange propensity so often observed in some tame Monkeys of biting its tail.

The next group of the Lemuroids is that which has given the name to the whole sub-order.

THE GREY OR BROAD-NOSED LEMUR. (*After Schlegel and Pollen.*)

CHAPTER XV.

THE LEMUROIDA (*continued*).

3. LEMUR.—4. CHEIROGALE.

Called by the French *Makis*—Restricted to Madagascar—Their Activity—Different Species—How to distinguish them—THE RING-TAILED LEMUR—Reason for the Name—Tail—Colour of Body—Eye—Hand and Foot—Geographical Range—Anatomical Peculiarities—Playfulness in Captivity—THE WHITE-FRONTED LEMUR—Specimen in the Zoological Gardens—THE LEMUR OF MAYOTTE—Where Found—Colour—Manner of Life—THE MONGOOSE LEMUR—Description of one sent to Buffon—THE RUFFED LEMUR—Described by Ellis—Domesticated Specimens—THE BLACK LEMUR—Geographical Range—Hand—Foot—GENUS CHEIROGALE—Bushy Tails—Resemblance to the Hapalemur—Nocturnal Habits—Difficult to distinguish—THE FORKED-CROWNED CHEIROGALE—Wonderful Powers of Leaping—Cry—Reason for the Name—A Nest-making Variety—Specimens in the Jardin des Plantes—Resemblance to the Galagos.

THE animals which are included in the genus Lemur are popularly called by the French the *Makis*. They are restricted, geographically, to Madagascar, and to some of the adjacent islands, and are not found elsewhere. Instead of roaming along the boughs and through the woods with a restless activity during the night, after the manner of the Lemuroida already described, the Makis move, gambol, and jump with great agility by daylight. Resting during the hours of the night, they run along the branches after daylight, searching for their food, which consists principally of fruit and occasionally birds' eggs, and even of the small birds themselves. They are very active, and as the conformation of their limbs adapts them for an arboreal existence, they rarely come to the ground.

Having, without exception, all the peculiarities of animals which move and prey by day, it is very

curious that the species of Makis should be classified under a genus bearing the name of Lemur. But in this instance, as in many others, the original derivation of the name has but slight or even no reference to the peculiarities of the animals which are thus artificially designated by it, and of course great confusion results.

There are many species included in the genus Lemur, and there is great difficulty in discriminating between them, for many of them are very variable, and therefore it is probable that it will be much restricted with the advance of the knowledge of the zoology of Madagascar. All have a long snout, a small, flat, and long skull, and a long body with narrow flanks. The hind limbs are rather longer than the front ones, and there is a long furry tail. The feet and hands are short, and the great toe is broad; moreover, the ears are moderate in length, and are either tufted or are hairy. In some kinds the head is surrounded by a ruff of fur, and the colour of the hair differs according to the species, and is even different in individuals of the same kind.

Thus, a black Lemur, called *Lemur niger*, has a female which has white whiskers, and another with a black-and-white fur, which is called the Ruffed Lemur (*Lemur varius*), has a young one which is red, so that all these different tints having been formerly recognised as belonging to different kinds or species are now proved to be natural varieties of fewer species.

The males of many kinds differ from the females in colour, and from the young also; moreover, at certain times of the year, according to the age of the animal, the fur changes its tints, and a corresponding alteration is produced by different food, so that the great number of species of Lemur described by naturalists must be regarded with suspicion.

A careful plan in discriminating the species is to divide them after the fashion—but not with the same intention—of the late Dr. Gray, of the British Museum. He made certain groups, and called each a genus, but this last proceeding was not correct. One of his groups are as follows:—For example, Lemurs with faces without a ruff, the tail ringed, and a bald spot above the inside of the wrist.* The first kind about to be described belongs to this set, and is

THE RING-TAILED LEMUR—THE MACACO OF BUFFON—LEMUR CATTA—THE CAT-LIKE LEMUR.

All these titles refer to the pretty Cat-like Lemur with chinchilla-grey tints, and a banded tail of black and grey rings, which is so commonly to be seen at the Zoological Gardens. It is so familiar, and has been so carefully examined, that it is advisable it should occupy some space in this description of its natural history.

The naturalist's name for this creature aptly denotes a Cat-like resemblance—a similitude due, perhaps, partly to size, certain tints of colouring, a peculiar arching of the back, and the long tail carried aloft, recalling at once purring Pussy. The tail, a striking feature, is several inches longer than the head and body taken together; it is clothed with abundance of long, soft, fluffy hairs, and alternately marked with rings of black and white. The predominant colour of the body and legs is chinchilla-grey, with a sprinkling of reddish hairs or rusty wash on the back; the under parts, however, are pure white. The cosy covering of delicate woolly fur, shorter than on the tail, stands out, instead of being smooth and sleek. The head is of a conical shape; the flattish depressed oval ears, by no means prominent, are sparsely hairy within, and are edged with short white hairs. The muzzle is nearly bald and black; the eyes are broadly encircled by the same colour, the remainder of the head and throat being snow-white. The eye, full, conspicuous, and softly expressive, is of a rich orange hue, with a dark pupil, and the eyebrows are represented by a few long black straggling hairs. There is a moustache and beard, but no vibrissæ (smellers), as in the Cat-tribe. The hind limb far exceeding the fore-limb in height, mainly causes the attitude of back-arching when on the ground. The fore foot is a kind of diminutive flat-nailed hand, with a proportionally short thumb, and it is hairy above, but naked below, and all the fingers have expanded cushions on their last joints. The hand is not capable of being closely clenched, and the thumb only reaches to the middle of the palm. The hind feet are large, and there is a strong great

* This classification is not that adopted by comparative anatomists, but rather by zoologists.

7 RING-TAILED LEMURS.

toe-thumb. Moreover, a true claw adorns the next toe, and in many other respects there is a certain agreement between the foot and hand. Both are black-soled, and the beautiful tracery of the pronounced cross lines, furrows, and folds would delight the heart of a gipsy fortune-teller. The mammæ, or teats, are two in number, and are placed near the armpits. Usually the species of Lemur have but one, or at most two, little ones at a birth, and the period of gestation is about one hundred and ten days, the young Lemur being born almost naked, and nearly without fur. Their hairs are short and sparsely distributed, except on the head, where they form a kind of belt around the eyes. They cling on to their mother's fur, and, holding on to that over her stomach and abdomen, they lie across her, so that when she draws up her legs she either hides the little one effectually, or it may be seen hairless in the folds of the mother's groins. After awhile, and as the young Lemur becomes better clothed and stronger, it leaves this snug and warm retreat, and crawls up on to the mother's back and shoulders, and seizes her fur, and holds on with such tenacity that she can jump and bound about without unseating her little burthen.

Lemur Catta inhabits a circumscribed region. Its range is along the south and west coasts of Madagascar. Social, and banding together in troops, they feed on the fruits of the forest, and occasionally, it is averred, capture insects and small birds. Those kept in confinement, however, are far less carnivorous than the smaller and livelier nocturnal Galagos to be described hereafter. They seem remarkably sensible to cold, huddling and crouching close to one another as if heat and comfort were indispensable to their nature. At such times their tails are wound round the bodies of their companions and of themselves in a very odd fashion. Ordinarily very good-natured, they like to be fondled, and come down to be fed, uttering either a grunt of satisfaction or a loud plaintive cry, but it is stated that in Madagascar when the wet season comes on they become much excited, and rush about quite careless of danger, grunting terribly. They do not tease each other like Monkeys, and do not jump about on their hind legs alone, to do mischief of all kinds; on the contrary, they leap on all-fours with great agility and quietude, and in a light-hearted sort of way. They use their hands in grasping objects given to them, and feed themselves with them; but, like the Monkeys, they often scratch with the hinder extremities, and do not use them to put food to their mouths.

On looking into their anatomy it will be noticed that the back-bone has none of those graceful curves so characteristic of man, and which are modified and less perceptible in Apes. It is made for going on all-fours and jumping, and consists of some twenty-nine pieces, or vertebræ, there being also twenty-six in the tail. Having good lungs, the chest is capacious, but is long and flattened at the sides, and there are thirteen ribs on either side, and a central breast-bone, or *sternum*, composed of seven pieces.

The skull has large eye-cavities, or orbits, and (as in Indris) they are not closed behind by bone, but are open there, though the angle of the lower jaw is not turned in or inflected. The diet of the Ring-tailed Lemurs being both vegetarian and of insects, or an occasional small bird, their teeth are very equally distributed as regards their kinds. There is a good set of front teeth for tearing and incising, the full number of canines for piercing and killing, and the full number of grinders. The numbers are on either side of the upper jaw—two incisors, one canine, three false, or pre-molars, and three true molars, and on either side of the lower jaw is a corresponding number. Thus this arrangement resembles that of the milk teeth of Indris, but the front teeth of the lower jaw stick out in a remarkable manner. Corresponding with their teeth are the digestive organs, which are more suited for the assimilation of vegetable food than for a purely carnivorous diet. These measure nearly seven feet in length, and the blind-gut, or cæcum, is about a foot long. There is one point of great interest in the throat of this Lemur, especially when the animal is considered as intermediate between some Carnivora and the American Monkeys. This, the organ of voice, has a small laryngeal pouch, recalling, or rather foreshadowing, the great ones of the Howlers; and the bone at the base of the tongue (the hyoid) has a body and projections, which resemble those of the Carnivora rather than those of the Monkeys. In the wrist there is the ninth bone.

When in captivity, the Ring-tailed Lemur soon becomes attached to its keeper, and they show some powers of memory. A quartermaster of the French frigate *Dupleix*, who had one on board, was recognised by it when surrounded by all the crew. This little creature liked to play with the cabin-boys and the Dogs, and took charge of, and protected, a little Monkey belonging to one of the sailors.

The Monkey was fondled and nursed, and cleaned with great attention by its active little friend; but corresponding kindness was not shown to the ship's fowls, whose tails it pulled unmercifully.

THE WHITE-FRONTED LEMUR.*

This is easily known by its broad band of white fur encircling the forehead, cheeks, and ears, and contrasting with the black muzzle, which is long and compressed. It is restricted in its geographical range to Madagascar.

Several of these White-fronted Lemurs have been brought to Europe from time to time, and have been kept in the Zoological Gardens. Their habits are simple enough. They often exhibit great vivacity, and are much given to leaping from one object to another, in which they are aided by the pad-like structures of the hands and feet.

THE LEMUR OF MAYOTTE.†

There is a kind of Lemur which lives in the island of Mayotte, one of the Comoro group between Madagascar and the mainland of Africa, and which is not found elsewhere. It is known as the Lemur Mayottensis, or the Lemur of Mayotte, and is remarkable for the strange variation in the colour of its fur. Probably there are five different colours, which are peculiar to different individuals of this species, and they have all received different names. These are termed varieties. But of what are they varieties, and which is the animal whence they have varied? These questions cannot be answered; and therefore this group of forms constitutes a species—a species really being a term which includes the sum of all the possible varieties of an animal. One of the varieties is the Black-fronted Lemur, which inhabits Madagascar itself, and as there is every probability that at one time the Comoro Islands were joined on to Madagascar, the existence of apparently different species, but really only varieties, can be explained.

These animals live in companies composed of from six to twenty, in the virgin forests of Mayotte, and they may be seen in broad daylight or at night. They lead an arboreal life, but they occasionally come to the ground after fallen fruit. They are hunted with Dogs, and when closely pressed, they take refuge in the highest branches, look fixedly at their enemy, growl, and wave their tails. When they see the hunter they rush off and take prodigious leaps, and go into the very depths of the forest. Should one be wounded it will defend itself against the Dogs, and will even jump upon them and bite their ears. They are fond of fruit, and especially of the wild date, and they wander far and near in numbers seeking their favourite food.

THE MONGOOSE LEMUR, OR WOOLLY MACACO.‡

The great naturalist Buffon had a Lemur sent to him as a present, which he kept as a pet for many years. At first it ran about the house, and was tame and full of fun, roaming here and there, and settling down before the fire like a common Cat. It was very good-natured, and became a great favourite; but with age came ill-temper, and it became cross and vicious; moreover, it was always making disturbances, so it had to be chained up. Having some ingenuity and perseverance, it managed to slip its chain now and then, and to escape. It made its way directly into the street, and used to visit the confectioner's shop, where it very quietly and systematically roamed in search of sweets, devouring all it could lay its hands on. If it could not get sweets it would take fruit, and was quite heedless regarding the price or the rarity of its desired treats. When it was known that it had escaped, if the shop-people had not already told Buffon, every one knew where it was to be caught, and a great trouble the catching was, for it got into corners, showed fight, and bit, and resisted being touched very decidedly. The cold, however, was its great enemy, and it always suffered much from it, and finally died from its effects.

The Mongoose Lemur, as it is often called, has a long head, flat forehead, and large canine teeth. It is of a reddish-grey colour generally, the crown of the head, the face, and chin being black; moreover, there is a streak of the same colour up the forehead, and across the crown. The cheeks and the side of the forehead are iron-grey, and this and its black nose distinguish it.

* *Lemur albifrons.* † *Lemur Mayottensis.* ‡ *Lemur mongoz.*

It carries its fine tail well stuck up when it runs about, and jumps on all-fours from place to place, and grunts with pleasure when fed and noticed.

The last group of the genus Lemur contains kinds which have a ruff of fur on the cheeks and neck, and the ears are pencilled at the end, the wrist being moreover hairy. They are common in Madagascar, and two of them are worthy of notice, namely, the Ruffed Black-and-white Lemur, and the Ruffed Black Lemur.

THE MONGOOSE LEMUR, OR WOOLLY MACACO. (*Male and Female, partly after Sclater.*)
From the *Proceedings of the Zoological Society.*

THE RUFFED LEMUR.*

Ellis, when journeying through one of the Madagascar forests, noticed, one bright, clear, and bracing morning, a peculiar shouting or hallooing, apparently at no very great distance. It was, he wrote, "not like any sound I had heard before, but resembled that of men or boys calling to each other more than anything else. At first I thought it was a number of people driving cattle out of the forest into the road. Still I heard no crashing amongst the underwood, and saw no signs of bullocks. Then I imagined it must be a number of bird-catchers, or squirrel-catchers. But on

* *Lemur varius.*

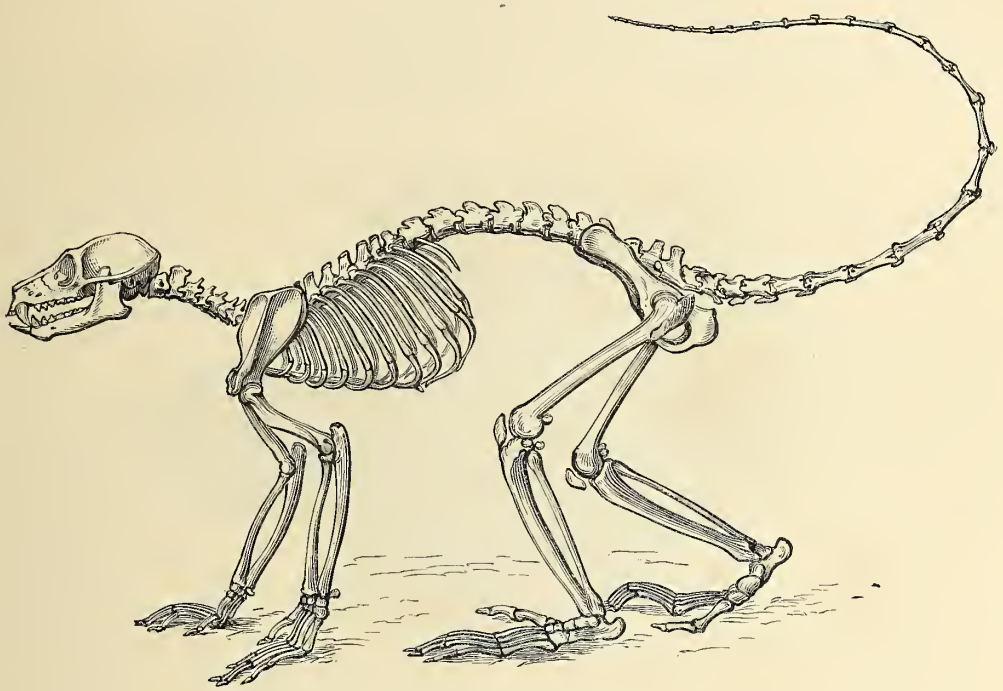
inquiring of my companions they said the noise proceeded from the Black-and-white Lemurs—*Lemur macaco*, or *Lemur varius* (Geoffroy)—of which there were great numbers in the forests. I had repeatedly seen Lemurs of more than one species in the market at Tamative, and numbers among the people of the place. There were two or three of the large ruffed Lemurs in a house near my own dwelling, and they seemed to be quite domesticated. Though covered with thick, almost woolly, hair, they appeared to be ill at ease in wet or cold weather, but to luxuriate in the warm sunshine. I often noticed two or three of them together on a fine morning after rain; raised upon their hind legs, on the outside of the house, leaning back against the wall with their fore legs spread out, evidently enjoying the warmth of the sun which was shining upon them. They are often kept tame by the natives for a long time, and numbers are sold to the masters of ships and others visiting the port.

THE RUFFED LEMUR. (*After Schlegel and Pollen.*)

We had one on board the ship in which I made my first voyage from Madagascar. It was a fine animal, and during the twenty-eight days of our passage I had frequent opportunities of observing its disposition and habits. It was tied to a boat on deck, and in a basket under the fore part of the boat it found a partial shelter from the rain and wind. It conveyed its food—boiled rice and fruit—to its mouth by the hand; and it was gentle and sociable, seemingly grateful for any trifling notice or kindness. I frequently gave it water, which it lapped like a Dog, and occasionally a banana; and in a short time it seemed to watch my movements whenever I came on deck, jumping on my arm or shoulder if I approached the boat; but was most delighted when, attaching a long line to the short cord tied round its body, I loosened it from the boat and allowed it to run up the cords or rigging, which it ascended with astonishing ease and speed, sitting sometimes with apparent pleasure on the extremity of the yard. It was scrupulously clean, and seemed unable to endure any tar or other dirt on its shaggy coat. One morning, during a heavy gale of wind, when there was much motion of the ship and great confusion and noise among the sailors, the Lemur seemed unusually excited, and clapped its hands together, and chattered loud in a most extraordinary manner, occasioning great uneasiness amongst

the crew of Malagasy sailors, who declared it was an omen of evil to the ship, and that some fearful calamity might be expected. I had felt so much interest in the sociable and apparently gentle animal on board ship, that I should have been glad to have seen some of its species in their own forest homes; but though numbers were evidently near, none of them came within sight."

This Lemur has, as its name implies, a black-and-white fur; the white tint is very general near the skin, and black is put on in patches, the tail being completely of that colour. It has a long face and skull, with a high nose and a narrow space between the eye cavities.



SKELETON OF THE RUFFED LEMUR. (*Modified after De Blainville.*)

THE BLACK LEMUR.*

It is this Lemur which has a mate with white whiskers and a white patch on the lower part of the back, whilst its own colour is uniformly black.

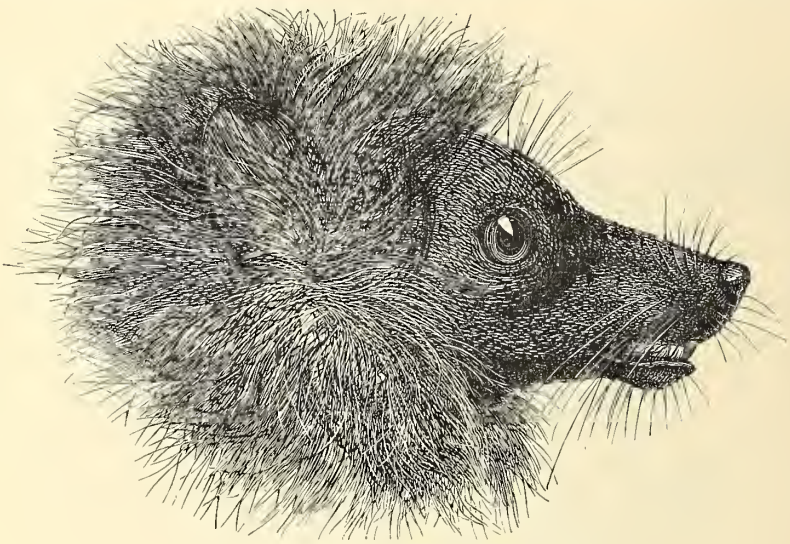
It inhabits the north-west of Madagascar, and the Sakalaves call it Acoumba. M. Pollen noticed one of the white-whiskered yellowish-red coloured females with a little black young one (a male) on its shoulders, and when the mother was shot, it fell with her, so tightly had it grasped her wool. They live in companies, and like the very tops of the tallest trees of the forest for their home; they are usually seen in the evening, when they make a great deal of noise with their concert of grunts and cries, and they jump from bough to bough quite as quickly as a bird flies. They have a trick of falling down suddenly, when pursued, into the underwood, and when the hunter searches for them they will be seen rushing off to a distant tree. When reared in captivity they are docile and affectionate. They like to sit on their keeper's shoulder, and will eat nearly everything that is offered to them. Fruit they prefer, but they will crack a bird's skull and eat the brain. In some districts of Madagascar these Lemurs are not allowed to be killed or to be kept either dead or alive, on account of some superstitious ideas of the natives.

One of the most remarkable peculiarities of this Lemur is the marked padded nature of the hand. The palm of the hand is longer than the fingers, and the thumb is not much bigger than the little

* *Lemur niger.*

or fifth finger. The fourth finger is slightly the longest, and its tip, as well as those of the other fingers, is furnished with a well-marked pad, which gives a roundness and fulness to the last joint, or phalanx. The fleshy pads of the palm and fingers are also numerous, and the largest occupies the position on the palm of the ball of the thumb in man, whilst in front of this there is a pad space on the palm close below the first joint of the index finger. A smaller pad is placed behind the roots of the third and fourth fingers, and there is a pad at the root of the fifth digit. Two long pads are seen behind this last on the outer margin of the palm, which converge towards the great pad of the base of the thumb. These six pads of the palm form an ellipsis around the centre of the hand, and are of paramount importance in preventing the jar of jumping.

The under part of the foot of the Black Lemur is at first sight very much like a hard palm, with a great thumb, for the great toe is large and thumb-like. The four other toes are finger-like, and are very slightly



HEAD OF THE BLACK LEMUR. (*After Mivart.*)

larger than the fingers of the hand; and the sole, although narrow and rather elongate, resembles a palm somewhat. The second toe is small; and although it has a small pad beneath its tip, a distinct and sharp nail projects from the last phalanx. All the other toes have large pads beneath their tips, and assume more or less of a rounded shape at the ends. The great toe's pad is large and almost circular in outline. There is a large pad at the base of the great toe, which is almost divided into two by a furrow, and each of the remaining toes has a small pad at its junction with the sole, and there is one along the outer border. All these tactile pads with cushions of fat on the palm and sole act admirably as buffers, and prevent injury to the joints of the bones, as the Lemur terminates its leap by bringing its extremities in sudden contact with boughs or small trees. Moreover, they enable the animal to distinguish substances by their very sensitive surface. By being placed at the base of the fingers and toes on the palm or sole, and by being separate and along the edge of elliptical spaces, the movement of the fingers and toes still retains their independence. Moreover, the existence of a central spot between the pads favours the movements of the palm and sole, and assists in the opposable nature of the thumb and first toe. The pads on the under part of the ends of the fingers and toes appear not only to act as cushions, but to enable the Lemur to distinguish the nature of the substances with which they come in contact. They are therefore sensitive, and may be termed extraordinary organs of touch. A circlet of very long hairs projects and radiates round the ears of this Lemur, and gives the animal a very peculiar appearance.

GENUS CHEIROGALE.*

There are many very small bushy-tailed and almost Rat or Squirrel-like Lemuroida in Madagascar, which have a most curious habit. In England Hedgehogs, Dormice, and Bats—and in other countries the Marmot and other animals—hide up on the approach of winter, and go off to sleep for many a long day until warm weather returns, and food can be obtained; and this is done also by many reptiles, and not a few insects. They take their winter's sleep like the Water-rat—

> "And when cold winter comes, and the water-plants die,
> And his little brooks yield him no further supply,
> Down into his burrow he cozily creeps,
> And quietly through the long winter-time sleeps."

And in Madagascar, where the heat is always great, and there is a wet and dry season, food being always in great abundance, these little bushy-tailed things go off at a certain time into a nest of leaves, and doze away for weeks, whilst their fellows are scampering around them during the moonlight nights, and imitating them in their sleep whilst all nature glows in the tropical sun. In temperate climates where there is a winter, this long sleep is called wintering, or hibernating, and in the hot climate it is called the summer sleep.

Why some animals should do this and others not, why some should sleep long in winter, and others in summer, and why all should be most regular to their time of taking their nap, are questions well worthy of any one's attention, and especially because they cannot be answered. Some of the hibernating animals awake for a little time now and then, and take food, but others get quieter and quieter, their breathing becomes slower and slower, their heart beats with diminished force and rapidity, and their temperature falls; but, on the other hand, the irritability of the muscles, especially of those of the heart, increases; and in these—for instance, in many of the Bats—the hibernation is not a commonplace, long-continued slumber, but a necessary matter, and the awakened sleeper dies.

Let us notice what takes place in the hibernators. They get into a place out of the light, and where the temperature is tolerably equable, and after having got nice and fat previously, they settle down in different positions, according to their shape, and go to sleep. They avoid too cold places, and get out of the range of the action of frost. Now taking no food, breathing very slowly, with very slow pulses, and indulging in no exercise, there is very little exhaustion going on. The quantity of fat stored up by the animal in its body generally consumes away, but very tardily, for the oxygen in the blood is at its lowest ebb, and the arterial blood resembles that of the dull purple veins. Under ordinary circumstances, if the whole of the blood is in this condition, the muscles of that side of the heart which propels the pure blood throughout the frame lose their power of contraction, and death ensues. But in their hibernating condition their irritability is increased, and they pump the impure blood as well as they did the bright scarlet fluid of old. At last the fat is consumed, the animal gets thin, and by the time the spring comes it is ready for its new life.

Now the little *Cheirogales* of Madagascar certainly do part of all these wonderful things. They get fat, and their tails attain a most dignified size; then they retire for their summer sleep, grow thinner and thinner, and finally come forth with such miserable vestiges of tails, so thin and miserable-looking. Their time of quietude is during the hot and dry season, and is equivalent to our winter, and they fatten up during the months when the warm rain makes everything to grow in profusion. It must be noticed that although these Cheirogales greatly resemble the Lemurs already described, they have no special construction which necessitates this sleep.

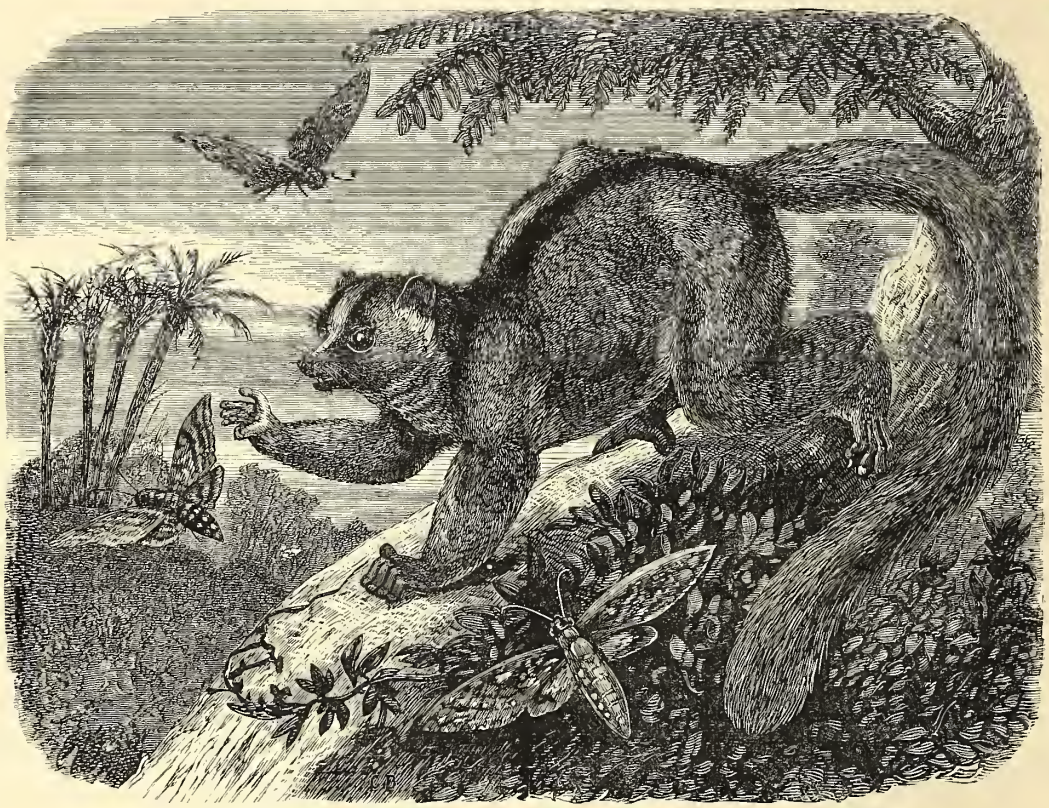
These Cheirogales resemble the Hapalemurs in shape, and may be known by their small size, their long tail, which is either conical or cylindrical, and by their face, which is scarcely narrower in front than behind. Having long ankle-bones, the back muscles of the leg have a great leverage over the foot, which enables the creature to make its easy jumps. Being nocturnal in their habits, they have very large eyes, and rounded and short, but sharp-sensed, external ears. They are vegetable feeders, yet most of them are extremely fond of something alive to eat, and, indeed, are greedy enough when

* χείρ (hand), γαλῆ (Weasel).

they have the opportunity of catching insects. Having wonderful powers of sight, and of rapid jumping, they watch for their prey, and approach it quietly, and finally descend from some height with the stealthy swoop of an Owl, catching the Beetle, Spider, or even small bird, and tearing it to pieces with astonishing celerity. They have a shrill cry at night, which is loud for such small creatures, but their usual voice is soft.

Holes in trees are used by the Cheirogales for hiding-places and nests for their young, which do not accompany the mother at first out of their safe retreats.

Naturalists have had a vast amount of trouble in distinguishing these little Lemuroids one from



THE FORKED-CROWNED CHEIROGALE. (*Modified after Schlegel and Pollen.*)

the other, and there has been a vast amount of confusion about their names, but the following are interesting for many reasons.

THE FORKED-CROWNED CHEIROGALE.*

The "Walouvy," or "Tantaroué-léla"—for such are its Malagasy by-names—is found in abundance in the forests on the western side of the island, but it equally inhabits the eastern parts of Madagascar. Their choice of a domicile is ordinarily in the hollow of a tree, particularly in one with a double aperture; and in their selection they not unfrequently stumble on a cavity already occupied by Bees, but this does not deter them from having a share in the busy business concern. For the natives pretend that it has a preference for the society of the Bees, doubtless with an eye to the dainty luscious honey, which it steals as opportunity offers. They make incredible leaps, so that it is extremely difficult to capture them. At night their cries resound in the woods almost continuously, and their noise somewhat resembles the piercing tones of the Guinea-fowl, a kind of "Ka-ka-ka-ka" being uttered loudly and precipitately.

* *Cheirogale furcifer.*

The name of this species comes from a dark brown streak which passes along the whole length of the back, and over the head, to fork into two bands—one over each eyebrow. Whatever may be its liking for honey, it has the means of biting hard fruit, for it has large middle front teeth, and also a strong first upper false molar. As a whole the teeth number the same as in the first division of the American Monkeys.

COQUEREL'S* AND THE DWARF† CHEIROGALE.

Another of these little Lemuroids, called Coquerel's Cheirogale, is celebrated as a nest maker, for it gathers dead leaves, and twigs, and grass, and makes a comfortable nest of large size, for it is a foot and a half in diameter. It goes into it by day, and sleeps soundly whilst the sun is up, but comes out at dusk to leap, crawl, and swing amongst the trees, looking out for live food quite as much as for fruit.

M. Milius, who was Governor of the Island of Réunion in 1821, gave a pair of little Lemuroids, each being about nine inches in length, with a long tail, to the Jardin des Plantes, at Paris. They lived there for some time, and used to get out of their cages at night and wander about the rooms and places where the beasts were confined. At dusk, after having been very quiet all day, they got up and stood well on their hind legs, and began to jump to and fro like mad creatures, and they kept it up when the room was quite dark, for they could be heard rushing about amongst a crowd of cages tenanted by other animals; but if the least light were admitted they darted through a small hole which led to their own cage, and were there again in the twinkling of an eye. They had beautiful silky fawn-coloured fur, and rolled themselves up in balls during the daytime, for the light seemed to be especially painful to them. In their captivity they were fed on bread, biscuits, and fruit.

One of the Cheirogales has a black circle around the eyes, and is called the Spectacled Cheirogale, and it is interesting because it is the species whose summer sleep has been noticed, and because it has an extremely important tail. This tail thickens greatly at the root, and tapers towards the end, not being cylindrical throughout, and it is the root which gets grossly fat, and finally excessively thin.

The last kind to be noticed is sometimes called the Madagascar Rat, or the Dwarf Cheirogale, for it is only four inches long, with a tail of six inches, and it might be passed by as only interesting for its small size and Rat-like look, but it has a most resplendent eye. The tapetum, or coloured tinsel-looking glaring structure situated deeply in the eyes, is so large, and the eye admits so much light at dusk, that quite an unnatural brilliancy is produced. They are night hunters, and are quiet and good-tempered when kept in cages.

They make true nests, like those of the crow, which consist of small interlaced twigs, in the midst of which there is a depression, with a bed of hairs for the young.

All the Cheirogales come, of course, from Madagascar, and they appear to inhabit the northern part of the island, and the east and west coasts, but not the south. They complete—with the exception of the curious Aye-Aye, which will be described at the end of this notice of the Lemuroida—the Madagascar Lemurs, and it is a point of interest to know that they are the only Madagascar Lemuroids which are pretty closely allied, so far as construction and shape are concerned, with any of the African kinds, which will now demand attention. Indeed, they and the Galagos of Africa have much in common, and are readily distinguished from the Indris and other Lemuroids already noticed. For instance, both have the long heel, or ankle-bone, the same number of teeth, and both have four teats, or mammæ—two on the breast, and two on the groin. They have no ruffs and no ear-tufts, and their brain is more triangular in shape than that of any other of the Lemuroida.

* *Cheirogale Coquerellii.* † *Cheirogale nain.*

THE MAHOLI GALAGO AND THE SENEGAL GALAGO. (*From the Live Animals in the Zoological Gardens.*)

CHAPTER XVI.

THE AFRICAN LEMUROIDA—THE GALAGOS.*

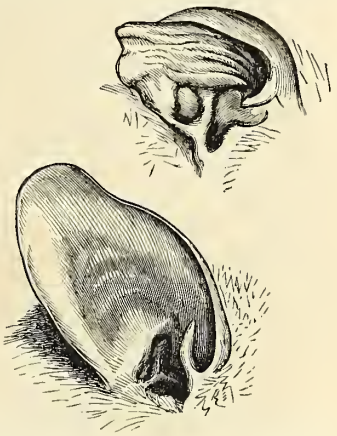
THE GALAGOS—DEMIDOFF'S GALAGO AND THE MOUSE GALAGO—THE SENEGAL GALAGO—THE SENNAAR GALAGO—THE MAHOLI GALAGO—THE GRAND, OR THICK-TAILED GALAGO—MONTEIRO'S GALAGO—THE AFRICAN SLOW LEMURS—VAN BOSMAN'S POTTO—GENUS ARCTOCEBUS, OR BEAR MONKEY TRIBE—THE ANGWÁNTIBO—THE ASIATIC SLOW LEMUROIDS—THE SLOW LORIS—THE SLENDER LORIS—GENUS TARSIUS—THE SPECTRE TARSIER, OR TARSIUS—THE MALMAG—GENUS CHEIROMYS—THE AYE-AYE—The Puzzle of the Naturalists—Opinions regarding it—Specimen Examined by Owen—Feeding—Teeth—Hands—Classification of the Lemuroida—Geographical Distribution.

THESE Galagos are most interesting, lively creatures, and they have wonderful ears, which are long, large, and elliptical, and can be furled up if the animals become frightened. Moreover, they have a long heel-bone, and the tail, often bushy, either equals or is longer than the trunk.

* *Galago.*

DEMIDOFF'S GALAGO AND THE MOUSE GALAGO.*

The distinction between these kinds is not very definite, but they are inhabitants of the West Coast of Africa, namely, Senegal, Calabar, and the Gaboon. The Rev. W. C. Thomson's account in a letter to Mr. Murray of what he suspects to be really and truly *G. Demidoffii* and *G. murinus* is well worth quotation. "Young ones of both species were brought to us about this period of the year (July 26). Mr. Robb has a young specimen of the smaller species just now, and about this time last year I became possessed of one of the larger. It is a most interesting and amusing pet, not only quite tame, but manifesting strong attachment. I had it for about six weeks in my possession, when, unfortunately, both for myself and it, it took a false leap into a water-canal and was drowned. It was a very epitome of zoology, of the size and colour of a large Rat; it had the tail of a Squirrel, the facial outline of the Fox, the membranous ears of the Bat, the eyes and somewhat the manners of the Owl in its cool odd way of peering at objects, the long slender fingers of a lean old man, who habitually eats down his nails, and all the mirthfulness and agility of a diminutive Monkey. It hated its cage at night, but delighted to leap upon the bars of the chairs ranged purposely round the table for it. It could clear a horizontal distance of at least six feet at a leap; and whenever it fell, as during its short apprenticeship it often did, and from alarming heights too, it gave expression of its apparent chagrin by a rough sort of purring. It possessed a curious power of folding its membranous ears back upon themselves, and somewhat corrugating them at pleasure; and it appeared to me that the palms of its hands and feet were endowed in some degree with the power of suction, such as the Walrus is said to possess in perfection. I have seen it maintain itself in positions where the mere lateral pressure of its limbs appeared to be inadequate for the purpose. I once applied it to the side of a cylindrical glass shade, of which it could not embrace so much as a third of the circumference, and sure enough it maintained its position for some time, gradually sliding down until it gave way. The palm was very much depressed, always clean and glistening, surrounded by five papilliform growths, those near the roots of the fingers serving as points of opposition to them, the fingers never closing beyond the palm. Mr. Robb had one of your species (*G. murinus*) in his possession for a considerable while. It devoured Grasshoppers, and even the fierce Mantides (leaf insects), greedily, as well as Moths, little as it was; but I never saw my kind muster courage enough to attack a Grasshopper or *Mantis*, though nearly twice as large as Mr. Robb's. No doubt mine would, by-and-by, have become less particular and more daring. The smaller species was very familiar, and used to run over people with perfect freedom. A favourite place of refuge was under his whisker, and between it and his shirt collar." According to the same correspondent, the little ones breed in captivity, but never grow more than about three or four inches long in the body; the larger kind, he says, within a year grow to six or seven inches long, or equal to a big Rat. Their voices differ, the larger animal's tone being lugubrious. He further says that the little creatures (*G. murinus?*) are gregarious or social in their wild state, travelling in small companies, and inhabiting a common nest, one of which he himself got a glimpse of. He saw several individuals rush out of it as he passed, and it answered in its situation and description to the account he had received of them, which was, that they were built on suitable forks of trees, with a foundation of clay and superstructure of dried leaves.



EARS OF MAHOLI GALAGO, CONTRACTED AND OPEN.
(*Original after Murie.*)

THE SENEGAL GALAGO.†

This is interesting from being the earliest known species of true Galago, and also as apparently having the widest range of geographical distribution. It is but a very little larger than the full-grown

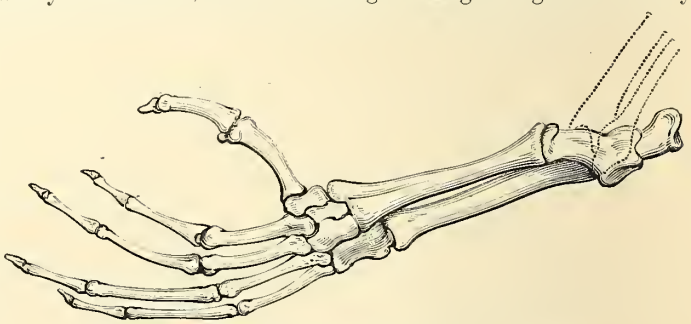
* *Galago Demidoffii and Galago murinus.*

† *Galago Senegalensis.*

species mentioned above, and has fawn-grey fur above, and yellowish-white beneath, with dark-brown feet and tail, and a white stripe on the face. It is common in the Senegal forests, even to the borders of the great Sahara Desert. Its habits in no way differ from the other Galagos, though it is asserted that when pressed by hunger it feeds on the gum-arabic, plentiful in the acacia trees of its native forests. Its eagerness in the capture of insect prey is well attested. It pursues Beetles, Sphinges, and Moths with great ardour, even while they are on the wing, making prodigious bounds at them, and often leaping right upwards to seize them. Should it by chance miss its object and accidentally fall from the branch to the ground, it re-ascends with the rapidity of flight to renew the hunt. In captivity it freely eats chopped meat, eggs, and milk. Although good tempered in confinement, it nevertheless is vivacious and petulant. At night it is always on the move, and if the occasion arises, darts off to the woods without a moment's delay. The Moors say its flesh is good eating.

THE MUSCLES AND TENDONS OF THE TAIL OF GRAND GALAGO.
(*Modified after Murie and Mivart.*)

The so-called Sennaar Galago* by some is held to be a different species, but by many is only deemed a variety of the preceding. This animal is plentiful on the wooded banks of the White Nile, and is spread over the forest tracts in Kordofan, and in the same latitudes to the Blue Nile in Sennaar, bordering Abyssinia. By the native name, "Camimdi," it is also well known in the interior of the East African Coast, viz., above Tete near the Zambesi River. If, moreover, the Maholi Galago, as certain authorities believe, is but a variety of the same, then the Senegal Galago ranges over nearly three-quarters the length and breadth of Africa.



FOOT-BONES OF GRAND, OR THICK-TAILED GALAGO.
(*Altered after De Blainville.*)

THE MAHOLI GALAGO.†

Originally discovered and described by the late Sir Andrew Smith in his "South African Zoology," this is one of the most charming and interesting little creatures imaginable. The general colouring of the upper parts is a yellowish or brownish-grey, with slightly darker brindling on the back, a broad nose-streak, cheeks and throat white, and a tinge of yellow intermixed with the white of the belly and inside of the limbs. The great tender-looking eyes are of a deep topaz yellow; the ears, flesh-tint inside and downy-white outside, are very big, and betimes are rapidly folded together like those of Garnett's Galago, giving the creature great variety of expression. The head is somewhat globular,

* *Galago Sennaariensis.*

† *Galago Maholi.*

with a short, high, almost pointed nose. The delicate woolly fur of the body lengthens and darkens on the tail, most so towards its end. Smith observes that they spring from branch to branch, and tree to tree, with extraordinary facility, and always seize with one of their fore-feet the branch upon which they intend to rest. In their manners they manifest considerable resemblance to Monkeys, particularly in their propensity to the practice of ridiculous grimaces and gesticulations. It spends the daytime in the nests which it forms for itself in the forks of branches, or in the cavities of decayed trees; and in these nests the females also produce and rear their young, of which there are generally two at a birth. Dr. Kirk found it common among the wooded hills of Kebrabassa, Batoka, and Nyassa, in East Africa. He says, singly and in pairs they came about the camp-fires at night, and in the dim light resembled a Bat in movements, by crossing from side to side, at single leaps, distances of six feet. A pair which lived a few years ago in the Zoological Gardens were a most interestingly tender couple. The day saw them nestled lovingly in their little box, and as night wore on they would peep out and cautiously and by stealth venture into their more spacious cage. Creeping down the branch, which served as a ladder, so noiselessly that not a movement could be heard, they would suddenly spring hither and thither, not like ordinary quadrupeds, but in a manner only to be compared with the leap and dart of a Tree Frog (*Hyla*). Approaching a dish of Meal-worms laid out for them, they would snap them up with their forepaws so quickly that the eye could not follow the motion; this rapidity of action equalled the Chameleon's tongue, whose protrusion and withdrawal baffles the eye, the fly gone being the main fact the observer is cognisant of. They seemed heartily to enjoy the Meal-worms, these being dainties in comparison with their ordinary food, which was sopped bread, rice and milk, and fruit. They were much more timid creatures than the impudent, rollicking Garnett's Galago,* whose habits were noticed in the beginning of our description of the Lemuroids. Neither were they by any means as noisy; indeed they seldom if ever uttered a sound, and that was only a subdued warning note. As regards their Monkey-like gestures, hinted at by Smith, this pair never showed any, their manner being rather Squirrel-like than otherwise. Occasionally a hasty contraction or curling together of each capacious ear simulated the scared grimace of a Monkey, but this action was one of surprise or timidity, and not that of the drollery and mischief of Monkey habit. On the whole, these Maholi Galagos appear to be animals of lower intelligence than the Monkey tribe.

MONTEIRO'S GALAGO.
(From a Photograph by Murie.)

THE GRAND, OR THICK-TAILED GALAGO.†

This handsome animal comes from both East and West Africa south of the Equator, and is about as large as a Cat, with a great bushy tail some three or four inches longer than the body. This appendage it carries aloft very majestically, or swerves it to and fro as a kind of rudder in climbing, occasionally sweeping it along the back and belly, or curling it around the body after the manner of

* This species, which intervenes between the Maholi and Grand Galago, we have already figured and described (see pp. 215, 216).

† *Galago Crassicaudatus* (Geoffroy).

the Lemurs. Being nocturnal in its habits, the eyes, which are large, and with great wide dark pupils and a brown-red iris, have a glassy, glimmering appearance in daylight, but look like balls of fire at night. The ears are a remarkable feature: about a third shorter than the head, they stand out like great, flattish, elliptical-mouthed trumpets, ever changing position and shape, and catching all sounds, and they are nearly bare within and slightly hairy outside. This animal has fur of a uniformly dark brown, and this colour mainly distinguishes it from

MONTEIRO'S GALAGO.*

This short description of the Thick-tailed Galago in a great many respects answers to another, which merits the title of "Grand," if dimensions a grade larger deserve it. One was obtained at Cuis Bay, south of Loanda, and was conveyed to England in the living state, being supposed to be only a pale variety of the last-mentioned species. The only visible difference from the latter seems to be that of

PALM OF HAND, GARNETT'S GALAGO.
(*Original after Murie.*)

SOLE OF FOOT, WITH LONG HEEL, OF GARNETT'S GALAGO.
(*Original after Murie.*)

colour, even this slightly varying. It is of a light chinchilla-grey all over, save the tail and the throat, which are nearly white. The nose is black and bare, and the feet are deep brown. The entire length of the animal is twenty-eight inches, whereof the tail is sixteen. The ears are a couple of inches long, and blackish. Mr. Bartlett remarks that when these are thrown forwards they give the head a resemblance to that of the Aye-Aye; but when they are folded back and down the physiognomy approaches that of the Douroucouli. Dr. Kirk (who accompanied the lamented Dr. Livingstone) says: "While the *G. maholi* is peculiar to the interior, where its geographical range seems to be great, the other, or Great-tailed Galago (*G. Monteiri*), is confined to the maritime region—so far as I know, never penetrating beyond the band of wood known generally as the mangrove forests. By the Portuguese it is named 'Rat of the Cocoa-nut Palm,' that being its favourite haunt by day, nestling among the fronds; but if it be disturbed, performing feats of agility, and darting from one palm to another. It will spring with great rapidity, adhering to any object as if it were a lump of wet clay.

"It has one failing—otherwise its capture were no easy task. Should a pot of palm-wine be left on the tree, the creature drinks to excess, comes down, and rushes about intoxicated. In captivity they are wild; during the day remaining either rolled up in a ball, or perched half asleep, with ears stowed away like a Beetle's wing under its hard and ornamented case (elytra). I had half a dozen Squirrels with one in the same cage; these were good friends, the latter creeping under the 'Golgo's' soft fur and falling asleep. On introducing a few specimens of Shrew (*Macroscelides tetradactylus*), the 'Golgo' seized one and bit off its tail, which, however, it did not eat. The food it took was biscuit, rice, orange, banana, guava, and a little cooked meat. Stupid during the day, it became active at night, or just after darkness set in.

* *Galago Monteiri* (BARTLETT).

"The rapidity and length of its leaps, which were absolutely noiseless, must give great facilities to its capturing live prey. I never knew it give a loud call, but it would often make a low chattering noise. It has been observed at the Luabo mouth of the Zambesi, at Quilimane, and at Mozambique. When I had my live specimen at Zanzibar, the natives there did not seem to recognise it; nevertheless, it may be abundant on the mainland."

Mr. Monteiro tells us that the Loanda specimens have not the character of being such a drunken lot of creatures, though they are arrant thieves, but otherwise he corroborates Dr. Kirk's observations. He mentions that they come in bands, and rob the fruit-trees of the villages. Their flesh is looked upon as good eating, and their skins are eagerly sought for, the fur being used to staunch wounds.

THE POTTO IN ITS SLEEPING AND WAKING ATTITUDES. (*Modified from Alph. Milne-Edwards.*)

In allusion to the Galago's inebriety, Dr. Gray relates that a friend of his gave a half-grown Scotch Terrier to a distiller, who soon returned it with the character of "habit and repute." The animal could not by any correction be prevented from drinking the spirit as it came from the still, or any spirits it could get, and it would stagger and reel about, verifying the term, "a drunken dog," so often applied to divine man.

THE AFRICAN SLOW LEMURS.

The rest of the African Lemuroids have not the habits, appearance, and anatomy of the Galagos, and are a very sad, weird, slow-going set, totally different from the active, careless kinds already noticed. A world of care seems to hang around their deliberate movements; they are images of Sleepy Hollow; they never are seen to spring and rush about, but ordinarily conduct themselves with great gravity and decorum. Slow they are, and hence their name the Slow Loris, and their body and limbs are not made for rapid locomotion. The limbs are nearly equal in length, their head is globular, and the eyes are uneven. The short ears and short fur are all of a piece, and so is the short tail (for this is most common), and the short second or index (counting the thumb as one)

finger. The back or rib vertebræ are fourteen or more, and the loin-bones are never less than seven. There is a remarkable division of the blood-vessels of the arms, loins, and legs called the *rete mirabile*. The vessels split into minute tubes, like hairs in calibre, but of two sizes, and lie closely adherent to each other in long parallel lines (see page 245); this arrangement, also termed a plexus, or plexiform, being similar in kind to what is met with in the Sloth tribe of South America. The Slow Lemurs inhabit both Africa and Asia, but are not found in Madagascar, and their mode of life is strictly arboreal and nocturnal.

The first African genus is *Perodicticus*.

THE ANGWÁNTIBO. (*Slightly altered after Huxley.*)

VAN BOSMAN'S POTTO.*

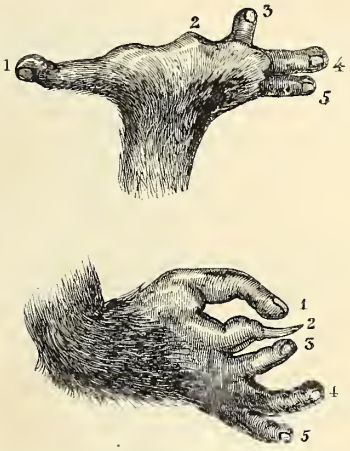
As far back as the year 1705, while on a voyage to the Guinea coast, the Dutch navigator, Van Bosman, came across a new and strange little quadruped which, on his return, he figured and briefly described under the name of Potto. The colonists knew it as the Bush-dog, and that it was slothful and retiring, seldom making its appearance except in the night-time, and then to feed on the cassada and other vegetables. It is remarkable for its singular hand, which has, as it were, a deformed fore-finger, and for a seeming protrusion of the neck-bones.

Like other tropical night-animals, the home or wild habits of the Potto have only been loosely studied. It is not restricted to the northern parts of Guinea, but is found on the Gold Coast and at the Gaboon River under the Equator. It shows a certain agility at night, clambering up the most smooth and polished branches with ease. When caught, and in captivity, one authority says, it sped along the cornices and angles within the house wherever there was the least elevation from the wall.

Those specimens which have lived in the Regent's Park Gardens from time to time have fed on

* *Perodicticus Potto.*

the same kind of food and exhibited no special differences of habit from the Slow Loris of Asia, presently to be described, if we except a more intractable disposition; for they have seemed rather addicted to giving an ugly bite whenever attempted to be handled, however gently. Mr. Bartlett managed to get one that showed a more amiable disposition, courting kindly stroking. When first obtained, it was so young that doubts were entertained of its surviving, especially as it suffered from the cold weather. To obviate this a small bag of hare-skin was made, fur inside, and Master Potto was placed therein. Furthermore, a bitch having whelps on the premises, one of the latter was put in with the young African for a while, then another, and so on in rotation, the animal heat of Potto being duly sustained. The latter clung to the puppies as it would to its mother, hugging them on the belly so tight that the doggies did not quite seem to relish their forced companion. This nursing, however, did well, and Potto was duly reared, and became on the whole good tempered.



HAND AND FOOT OF ARCTOCEBUS.
(*After Huxley, Zool. Soc. Proc.*)

A Mr. Skues records having purchased a female at Cape Coast on the 31st March, 1869, along with its young one, which had been born on the 8th February. They slept all day; the mother usually perched on a door, with the youngster clasped to her belly, by its fore and hind extremities. At dusk they came down and wandered about the room all night. After a time, young Potto scampered hither and thither on his own account. Milk and bread they refused, but would feed on pine-apples and bananas, with water. Although there were insects about the room, as is the case always in tropical climates, the Pottos were never detected eating them, but one day the mother was found busily munching at a tray of preserved Beetles. At Accra, circumstances prevented due attention being given them, and there the young one died aged twenty-two weeks. The mother survived only six weeks after on nearing Teneriffe. The negroes seemed to be much afraid of the Potto, which they called "Aposo," or "Aposou." It inhabits West Africa and the coasts of the Gulf of Guinea.

The hairs on the Potto are longish, soft, and woolly, mouse-coloured at the base, rusty in the middle, and paler tipped. Hence results a general chestnut tint, with intermixture of grey, the under surface being considerably paler. The limbs are nearly of one length; the head rounded, with slightly-hairy shortish ears, and moderately-projecting muzzle. The nose and chin are almost naked and flesh-coloured, the former grooved or nicked in the centre. The eyes are lateral and oblique, very convex, and with an oblong pupil. The index, or first finger, is very short, resembling a tubercle.

The nature and number of the teeth indicate a mixed diet, as there are four incisors above and below, and two canines in the upper and lower jaw. Then come three pre-molars and three lower grinders on each side in both jaws.

GENUS ARCTOCEBUS, OR BEAR MONKEY TRIBE.*

The next genus is very singular. The species has just the trace of a tail, and the index finger is reduced to a slight projection, or tubercle, on which there is no trace of a nail, and the fingers and toes about the lower joints are united by skin. The ear has two cross folds, and there are fifteen dorsal back-bones, and seven in the loin region.

THE ANGWÁNTIBO.†

Our knowledge of this curious African species, which comes from West Africa and Old Calabar, truly a "three-fingered Jack," is due to the Rev. A. Robb, when missionary at Old Calabar. From his

* A very surprising term, as it applies to a Lemuroid.

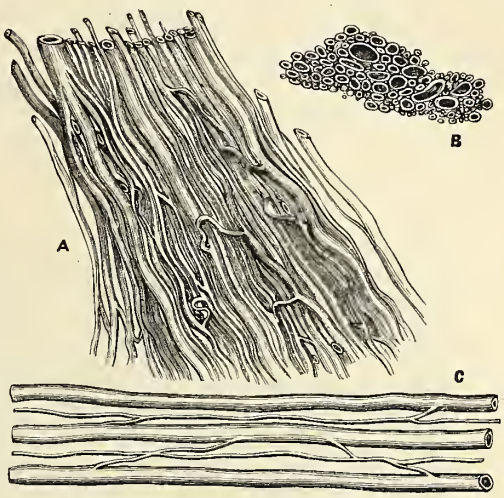
† *Arctocebus Calabarensis.*

letter (December, 1859) accompanying the bottled specimen first transmitted to this country, we gather the following history:—"The Calabar people call it *Angwántibo—angwán* means a farm, but we do not know the etymology of the second part of the word, and cannot say whether it arose from any habit peculiar to the animal. It lives in trees; but, being nocturnal, the people know exceedingly little about it. They cannot tell what it eats. A lad whom I asked said that he lived in the house, and it lived in the bush, how then could he know anything about it? My Krumen also recognised it as a

THE SLOW LORIS. (*After Tickell and Alph. Milne-Edwards.*)

countryman of theirs. They consider the one sent as a young one, and say that in their country it grows to the size of a common puss. Probably theirs is a different animal, but I cannot tell. They call it *Dwăn*, and say that it lays down the law to the other beasts, forbidding them to eat the young fruit when it begins to form on the trees. If the Monkey transgresses, the *Dwăn* seizes him, and holds him there till he dies—yea, the Monkey rots in his grasp. They say they are shot together thus. If the Monkey gets the shot, the *Dwăn* holds on; if the *Dwăn* gets the shot, they fall together. The Krumen say that the *Dwăn* eats fruit. This is all we know about it at present; and their (the Krumen) account seems somewhat fabulous."

Dr. Alexander Smith describes and compares the animal with the Potto. He mentions the following characters:—Above, yellowish-brown, the roots of the hairs, dark grey; below, paler, in some parts nearly white; hair, wool-like; length from muzzle to point of tail, 10½ inches, the tail being only a quarter of an inch long. The body is slender; the head oval and rounded, with a blunt but protuberant face; the eyes, full and large; ears, naked within, and with short hairs externally; nostrils, sinuous, and laterally placed; there is a projecting fold beneath the tongue, as in other Lemuroids, and the neck is short. The limbs are slender, the hinder a trifle larger and stronger than the others; both feet and hands conform to those of the Potto, with, however, a still greater reduction of the index finger. He observes that the hands and feet are divided, as it were, into two opposing portions, which he likens to the grasp of such climbing-birds as the Parrots. This peculiarity, along with the multiple blood-vessel division of the extremities, he thinks indicative of long-enduring muscular action, stealthy step, and adaptation for gripping twigs of trees, rather than for the purpose of capturing a prey.



A RETE MIRABILE. (*Original after Murie.*)

Greatly magnified, and partly diagrammatic representations of a *Rete Mirabile*. A. General appearance. B. Cross section of vessels. C. How the capillary vessels of two sizes join.

The anatomical peculiarities of the Angwántibo have been lucidly described by Prof. Huxley in the "Proceedings of the Zoological Society," where, from his examination, he substantiates Dr. Gray's separation of the animal generically from its African mother the Potto.

THE ASIATIC SLOW LEMUROIDS.—THE SLOW LORIS.*

There are two well-marked kinds of these Lemuroida to be met with in very large districts in the East, and they live in the tropical woods of Eastern and Southern Hindostan, Ceylon, Burmah, Siam, Cochin China, the Malay Archipelago, and in the great Islands of Sumatra, Java, and Borneo. But they do not live together in the same parts.

SLOW LORIS. (*From a sketch by Tickell.*)

The first to be noticed has the widest geographical range, and is to be found here and there from Hindostan to China, and from Burmah to the great islands. Hence quite a voluminous history is attached to this animal, whose singular appearance and habits, peculiar anatomy, and geographical distribution, have been the fruitful theme for travellers and naturalists of most European nations. He is called by many names, and is the Bashful Billy—"Chirmundi Billi"—of the Bengalese, or the Slow Lemur, and naturalists term him the Slow Loris, or Kukang (*Nycticebus tardigradus*). When he is turned out of his quarters in the daytime, he reminds one of a very young, awkward, puppy without a tail. But his eyes, however, are enormous and owl-like, and seem to start protuberantly forwards with an unmeaning stare. When his wits return, and the scare ceases, he softly turns on his heel, and with a very slow, measured pace—hand-over-hand, as sailors term it—makes for his box. There is a cool, sedate manner about his whole proceedings which may either be taken for wisdom or stupidity. During the night, when hungry cravings send him forth on his

* *Nycticebus.*

own account, his eyes light up, and he seems more alive to his interests, though seldom increasing the activity of his movements. On a table he waddles like a sailor newly ashore, but with a rope or bough to grasp, by foot or hand, there ensues a grip like a vice, and a steady mode of ascent putting him betimes out of reach or danger.

The eye of the Kukang, besides its adaptation to nocturnal vision, in the presence of a tapetum, or silvery lining to the choroid or blood-vessel layer, has also a singular manner of closing. Instead of the eyelids shutting from above downwards, as in the majority of Mammals, they approach obliquely outwards and inwards. This mode of closure is entirely due to an inequality in the fleshy fibres which surround the eyelid, and, together with the large pupil, somewhat elliptical in shape, produces in daylight a very strange, unmeaning look. It has a very odd knack of hanging to boughs, body downwards, and the way in which it is done, asleep or awake, apparently receives explanation from the mode in which certain of the flexor muscles are fastened above the knee-joint. Thus, by simply a bending of the leg, the toes are drawn (on bending) together, and hold fast without any sensible muscular exertion. The mechanism, in fact, is similar in kind to that which enables birds to perch while slumbering, or by which Bats adhere to crevices while suspended head downwards. It possesses the peculiar *rete mirabile* of blood-vessels already noticed.

Many anecdotes respecting the habits of the Nycticebus in confinement have hitherto found currency, a similar vein of narrative running through each. One kept by Mr. Baird some nine months had a preference for veal, fresh-killed fowls' necks, sugar, and gum arabic, cooked meat being abhorred. Instead of recounting old stories, we append the following observations of Captain Tickell, not hitherto made public :—

"This animal is tolerably common in the Tenasserim provinces, and in Arracan, but from being strictly nocturnal in its habits is seldom seen. It inhabits the densest forests, and never by choice leaves the trees. Its movements are slow, but it climbs readily, and grasps with great tenacity. If placed on the ground, it can proceed, if frightened, in a wavering kind of trot, the limbs bent at right angles, like a mutilated Spider. It sleeps rolled up in a ball, its head and hands buried between its thighs, and wakes up at the dusk of evening to commence its nocturnal rambles. The female bears but one young at a time. In confinement they are at first savage, bite severely, and in spite of general slow movements, can do so pretty quickly, uttering a rough grunt or growl. They, however, get quiet, if not absolutely docile, in time, and are kept without difficulty, requiring no other diet than plantains, or any other kind of fruit. They become content to remain in the smallest box, where another animal would soon pine and perish for want of exercise. When for a time confined they readily abandon their nocturnal habits, eat during the day, and rest at night. They will thus remain contentedly on an old punkah hung in a lumber-room, for many days ; but, unless thoroughly reclaimed, they will always seize an opportunity during night to escape, never travelling far, however, and generally turning up in some thicket or bamboo-clump, or other quiet corner in the grounds. They greedily devour all sorts of insects, and also birds' eggs."

On one occasion Captain Tickell watched an individual crawling along the floor to seize a Cockroach. When it had approached within ten or twelve inches, it drew its hind feet gradually forwards until almost under its chest ; it then cautiously and slowly raised itself up into a standing position, balancing itself awkwardly with its uplifted arms, and then, to his astonishment, flung itself, not upon the insect, which was off "like an arrow from a Tartar's bow," but on the spot which it had, half a second before, tenanted (see woodcut). This is its manner, however, of catching such of its living food as will wait long enough. Grubs, Caterpillars, and the slower Beetles (*Scarabæi*) are seized in one or both hands, and slowly carried to its mouth, and there solemnly munched up ; the Nycticebus looking all the time, with its delicate small muzzle and its protuberant eyes, like one of those apologetic pigmy Lapdogs ladies love to carry. It is almost wholly silent, but when roused to take food, now and then it utters a feeble tone, like the crackling of some substance in the fire. When angry, and about to bite, it gives forth a tolerably loud growl or grunt.

The above animal (with one or possibly two species) forms the genus Nycticebus, in which the body and limbs are short ; there is no tail, and the head is globular, whilst there are no less than sixteen back-bones with ribs. The index finger is short, and there is a nail on it.

The next genus is called Loris, or Stenops.

THE SLENDER LORIS*

Comes from Ceylon, Malabar, and the Coromandel Coast, and the Malays in Ceylon call it "Seyvoingoo," the Cingalese, "Onaha ppoolowa." The meagre figure and long lank limbs of this creature give it a droll, half-starved look, its skin-tight robes and silent melancholy lending oddity, but not gracefulness, to its charms. If seen during the day, and made to walk on a flat surface, what between its blinking, peeping eyes and awkward gait, a feeling of pity devoid of admiration is apt to arise. But watched at night, when it is clambering among branches, its character changes to that of a more lithe and nimbler animal, whose great staring eyes and gliding progress most surely

THE SLENDER LORIS, SHOWING ITS ATTITUDES AND HABITS. (*In part after Emmerson Tennent.*)

indicate a nature less apathetic than a more hasty conclusion would warrant. Its uncommonly long body, devoid of a tail, is rendered more striking on account of limb-length, and the colour is usually of an unequal sooty-grey, the back mingled with much rusty-tinted or tawny hairs. The under parts are whitish, and there is a light nose-streak. The space round the eyes, which are close together, is dusky, and on the head is a dark spot, pointing to the inner eyelid. As in other of the Lemuroid groups, there is no absolute constancy in depth of tint and markings, lighter and darker varieties being met with. The rounded ears are conspicuous, though not long and mobile as in the Galagos, and the face has a kind of Dog-like expression. The hair is very singular when the animal is alive; it resembles soft packed wool, somewhat curled and arranged in little tufts, as the hair on the scalp of the negro, but very delicate; it soon loses this appearance after death if much handled, as is always the case in removing the skin.

The Slender Loris is very common in the lower country of the south and east of Ceylon. Dr. Templeton, who had several of them, observes "that after a few months' confinement they soon begin to

* *Loris*, or *Stenops Gracilis.*

pine and die. One was particularly noticed. If the room was perfectly quiet about dusk, it ventured about, crawling along the rails of the chairs with a very gentle movement. There was an interval of nearly a minute in the closing of its hands on the parts of the furniture which it grasped in succession, while moving its head from side to side with much grave deliberation. But when a Spider or other insect came within its reach, its clutch at it was quick as lightning, and with equal rapidity it was conveyed to the mouth. It seemed particularly anxious to avoid having its hinder extremities touched. When approached, it retiringly slunk along the stick placed slantingly in the corner for its use, or along the back of the chair, with the usual deliberate movement. Its great goggle eyes would be fixed immovably on your face or hands if held towards it, and with every expression of fear. Its mouth appears small, and so little distensible that one cannot imagine it capable of biting anything except it be of very small size. The natives, nevertheless, assert that it destroys Peacocks in the jungle, seizing them by the neck, which it clutches with such tenacity that the bird soon falls exhausted to the ground off its perch, or in its sudden flight, attempting to escape its persecutor. Having devoured the brain, the Loris leaves the rest of the body untouched." Among the others in his possession, Templeton alludes to a female which gave birth to a young one. "This latter, when ushered into the world, was about two inches long, like a Mouse, perfectly without hairy covering, a large head, attenuated body, and excessively slender legs. The face and eyes were proportionally much smaller than in the older animal. It clung to the mother so tenaciously, that I believe it would almost have parted with its life than let go its hold." This baby Loris, he remarks, was not at all entitled to the usual appellation, Dog-like.

Sir J. Emmerson Tennent says that the Slender Loris, from its sluggish movements, nocturnal habits, and consequent inaction during the day, has acquired the name of the "Ceylon Sloth." According to him there are two varieties in the island; one of the ordinary fulvous brown, and another larger, whose fur is entirely black. A specimen of the former was sent to him from Chilaw, on the western coast, and lived for some time at Colombo, feeding on rice, fruit, and vegetables. It was partial to Ants and other insects, and always eager for milk or the bone of a Fowl. The natural slow motion of its limbs enables the Loris to approach its prey so stealthily that it seizes birds before they can be alarmed by its presence. During the day one which he kept was usually asleep in the strange position represented in woodcut (p. 247), its perch firmly grasped with its hands, its back curved into a ball of soft fur, and its head hidden deep between its legs. The singularly large and intense eyes of the Loris have attracted the attention of the Singalese, who capture the creature for the purpose of extracting them as charms and love-potions, and this they are said to effect by holding the little animal to the fire till its eyeballs burst. Its Tamil name is *theivangu*, or "thin-bodied;" and hence a deformed child or an emaciated person has acquired in the Tamil districts the same epithet. The light-coloured variety of the Loris in Ceylon has a spot on its forehead, somewhat resembling the *namam*, or mark worn by the worshippers of Vishnu; and from this peculiarity it is distinguished as the *Nama-theivangu*.

A curious animal, differing from the foregoing Slow Lemuroids, but Asiatic in its distribution, is the only species of the genus *Tarsius*.

GENUS TARSIUS.—THE SPECTRE TARSIER, OR TARSIUS. THE MALMAG.*

This is a small, active creature, which appears to excite great terror in the minds of the natives of the East Indian Archipelago, from its curious-shaped face, and sudden appearance at dusk. So impressed are the inhabitants of some portions of Java with its malevolent influence, that if they see one of them on a tree near their rice-grounds, they will leave them uncultivated.

About the size of a small, common Squirrel, this tiny cause of fright has a round head, like that of a Marmoset, a pointed muzzle, large ears, and staring eyes. Its grinning mouth gives a queer and comical look to the face. Its body is about six inches in length. The limbs are long, especially the hind pair, and the tail—about nine inches long—is slender, and furnished with a brush of long hair at the end. The colour of the body is fawn-brown as a rule, and the bare parts

* *Tarsius Spectrum* (GEOFFROY).

are of a flesh tint, and the forehead, face, and nose are reddish, and there is a black eye-streak. The name is derived from the fact of the "tarsus," or ankle-bones, being remarkably developed, the heel-bones being very long. There is but one kind as yet known, and it can be distinguished from all the other Lemuroids by the peculiarity of its front teeth. There are four upper ones and only two lower, and the inner pair of the upper jaw are much larger than the outer. There are four canine teeth; and there are twelve molar teeth in each jaw, six being false molars. These teeth are very crowded, and there is scarcely any space between them. The ends of the fingers and toes are well supplied with pads, which assist the animal in its jumping and clinging,

THE TARSIUS. (*Animal after Burmeister, but modified from specimens in the British Museum.*)

and the second and third toes have short, sharp, and pointed claws, which stand nearly erect. The nails of the hands are scale-like and triangular, and this is the case with those of the great and outer toes.

The cavity for the eye, or orbit, is unlike that of any other of the Lemuroida, for it is closed behind, and does not open there on to the temple; this is, therefore, very characteristic. But the globular-shaped head, although remarkable, is not quite so distinctive. The most striking anatomical feature, and indeed that which is observable in the outside shape, is the disproportionate length of the heel-bones and foot to the lower leg and thigh. It has a very small side-bone to the leg (*fibula*), and it does not reach to the ankle. Oddly enough, the third finger of the hand is the longest, and the second and fourth are nearly equal, presenting a difference with regard to the other Lemuroida. So that this small, active creature, with a Monkey-like appearance, has more resemblance to the Insectivora, and differs very considerably from the rest

of the group with which it is classified. The Spectre Tarsier, which inhabits the Oriental Archipelago and the Philippine Islands, has not been brought alive to England, but the late well-known naturalist, Mr. Cuming, gave the following description of its habits and peculiarities:—

"The Malmag is a small animal living under the roots of trees, particularly the large bamboo of these islands. Its principal food is Lizards, which it prefers to all other. When extremely hungry I have known it to eat Shrimps and Cockroaches, and give a great preference to those which are alive. It is very cleanly in its habits; never touches any kind of food that has been partly consumed, and never drinks a second time from the same water. It seldom makes any kind of noise, and when it does emit sound, it is a sharp, shrill call, and only once. On approaching it in its cage it fixes its large full eyes upon the party for a length of time, never moving a muscle; on drawing nearer or putting anything near it, it draws up the muscles of the face similar to a Monkey, and shows its beautiful, sharp, regular-set teeth. It laps water like a Cat, but very slowly, and eats much for so small an animal. It springs nearly two feet at a time. It sleeps much by day, is easily tamed, and becomes quite familiar, licking the hands and face, and creeping about your person, and is fond of being caressed. It has an aversion to the light, always retiring to the darkest place. It sits upon its posteriors when it feeds, holding its food by its fore-paws; when not hungry it will ogle the food for a considerable time. A male and female are generally seen together; the natives of these islands make sure of taking the second having secured the first. They are extremely scarce in the island of Bohol, and only found in the woods of Jagna and the island of Mindanado. It produces one at a time. I had the good fortune to procure a female without knowing her to be with young. One morning I was agreeably surprised to find she had brought forth. The young one appeared to be rather weak, but a perfect resemblance to its parent; the eyes were open and covered with hair. It soon gathered strength, and was constantly sucking betwixt its parent's legs, and so well covered by its mother that I seldom could see anything of it but its tail. On the second day it began to creep about the cage with apparent strength, and even climb up to the top by the rods of which the cage was composed. Upon persons wishing to see the young one when covered over by the mother, we had to disturb her, upon which the dam would take the young one in its mouth, in the same manner as a Cat, and carry it about for some time. Several times I saw her, when not disturbed, trying to get out of the cage, with the young one in her mouth as before. It continued to live and increase in size for three weeks, when, unfortunately, some one trod upon the tail of the old one which was protruded through the cage, a circumstance which caused her death in a few days. The young one died a few hours after, which I put in spirits."

GENUS CHEIROMYS.

Another Madagascar Lemuroid remains to be noticed, and it ought to have been described with those of that great island; but the creature is so unlike all the others, and is so manifestly inferior in its Lemuroid character, and peculiar in its construction and habits, that it is necessary to place it at the end of all. Its position in the scale of classification is at the end of the Lemuroida, for although it has many of their anatomical characters, it resembles the Rodents, or Gnawers, in others. It is called

THE AYE-AYE.*

This is one of the most remarkable animals in the world, both on account of its peculiar Squirrel shape and Lemur-like construction, as well as on account of its habits. The animal was first kept and described by the traveller Sonnerat, who obtained a male and female from the west coast of Madagascar. He kept them on board ship and fed them on boiled rice for two months, when they died, and he used to remark that they used a finger of each hand to eat with, after the fashion of the Chinese, who use chopsticks. Having shown them to some of the natives of the east coast of the island, they were surprised, and denied that these curious-looking creatures belonged to their part of the country; moreover, they ejaculated "Aye-aye" on seeing them, and thus gave the familiar name to the breed. It is now known that the so-called Aye-Aye chiefly inhabits the forests of bamboos, which are

* *Cheiromys Madagascariensis.*

numerous in the interior of the island. They are rare animals, and live a solitary life, or are found in pairs, but they never associate in bands of several individuals. They are essentially noeturnal in their habits, for they sleep all the day long in the thick bunches of leaves of the bamboos in the most impenetrable part of the forests, and they are therefore rarely seen, and are only met with quite by accident. The Aye-Aye feeds on the pith of the bamboos, and on sugar-canes, but it also loves Beetles and their grubs as a change of food. During the dark nights it awakens the echoes of the forest with a kind of plaintive grunting, and jumps from bough to bough, and clambers up the trees

THE AYE-AYE. (*After Owen, Trans. Zool. Soc., but modified.*)

with great agility and vivacity, examining the bark of old trees most carefully in order to find its favourite insect-food.

As daylight approaches, the Aye-Aye ceases its lively play and forest-roaming, and moves into the sombre shades of the densest foliage; there it avoids the light and the rays of the sun, and placing its head between the fore-feet, and encircling itself with its bushy tail, the now half-torpid creature sleeps on until the evening.

The Aye-Aye is about three feet in length, including the long tail, and there is a half Fox, half Lemur look about it, with a little of the Squirrel. The hind feet at first sight are like those of a Monkey, as are also the limbs; but the hands are not in keeping with the rest, for the fingers are of all kinds of lengths, and the middle one looks as if it were atrophied and wasted. A little care, however, proves that the ears, so widely open and spoon-shaped, and nearly naked, are larger than those of

these animals, that the head is really broader than theirs, and that the furthest end of the muzzle surmounts a perfect lip which hides four great front teeth, two above and two below. The tail is a very prominent object, and is longer than the body; it is straight, very bushy, flexible, and is covered with long coarse hairs, being thicker at the end than at the root. All the rest of the body, except the ears, nose, and the palms of the feet and hands, which are naked, is covered with a fur that is dense and furry underneath, and long and hairy at the ends; and it is these long hairs which give the general tint to the animal. The prevailing tint is a deep fuscous approaching to black; there is a little dark-red underneath, and yellow-grey on the throat nearest the head. Everywhere the dark colour is relieved by long scattered white hairs, which are very conspicuous on the back. On the back and tail the hair attains the length of from three to four inches. It has widely-open staring eyes, and whilst it is lively enough in the dark, it looks dazed and stupid in daylight. As if to render the animal more curious than ever, the teats, or mammæ for suckling the young, are not on the breast, but in the lower part of the body, and close to the groins, there being one on each side.

The Aye-Aye, so strangely constructed, has been a great puzzle to naturalists, and there have been many keen debates about its natural history. It is about one hundred years since Sonnerat stated that, although the Aye-Aye much resembles a Squirrel, "yet it differs therefrom by some essential characters, being also allied to the Lemur and the Monkey;" and in describing the fore-foot, he specifies the long slender joints of the skeleton-looking middle finger, which the animal, he says, "makes use of to draw out of holes in trees the worms which form its food." Buffon saw the skin of one of these specimens obtained by Sonnerat, and concluded that it is more closely allied to the genus of Squirrels than to any other, and that it also has more relation to a kind of Jerboa. After describing the hind feet, Buffon remarks that the opposite character of the thumb with the flattened nail separates the Aye-Aye widely from the Squirrel, and that of all animals that have a flat great toe-thumb nail, the Tarsier, a kind of Jerboa, is that which most resembles it. He ranked the Aye-Aye with the Rodents, or Gnawers. Nevertheless, Cuvier considered it to be one of the Squirrels, and by no means ignoring the opposite hind thumb, he still believed it to be an unusual or anomalous kind, but he was greatly led by the belief that the animal gnawed wood invariably for the sake of its only food, the worms and grubs. About the same time a German (Schreber), by examining the limbs, decided that the Aye-Aye was a Lemur, and he called it *Lemur psilodactylus*, or the "bare-fingered" Lemur; and after a while Cuvier obtained the skull and part of the limb-bones from Sonnerat's specimen, and examined the first especially. Then the great front teeth of the Aye-Aye, and the space behind them, influenced the great anatomist, who saw that it had the teeth of Gnawers (Rodents), and the skull of that of the Quadrumana, so he placed it in the list of doubtful animals. After his time, most anatomists considered the animal to be clearly allied to the Squirrels, and placed it amongst the Rodentia. But in 1859 Owen, from whose works the above notices of the progress of opinion on this subject have been taken, received an important letter from Dr. Sandwith, C. B., and a specimen of the Aye-Aye. The following letter explains the habits, and Owen subsequently described the anatomy of the animal, and placed it in its present position in the classification.

Dr. Sandwith wrote:—"After very great difficulty and much delay I have at length obtained a fine healthy male, a real Aye-Aye, and he is enjoying himself in a large cage which I had constructed for him. And now I have some questions to ask you. Do you want him dead or alive? It will, of course, be much easier to send his dead body home, if that will do; and if so, how am I to preserve him? If you want him alive you must tell me so without delay, as I think it would be dangerous to send him home in the cold season. I observe he is sensitive of cold, and likes to cover himself up in a piece of flannel, although the thermometer is now often 90° in the shade. He is a very interesting little animal, and from close observation I have learned his habits very correctly. On receiving him from Madagascar, I was told that he ate bananas, so of course I fed him on them, but tried him with other fruit. I found he liked dates, which was a grand discovery, supposing he be sent alive to England. Still I thought that those strong Rodent teeth, as large as those of a young Beaver, must have been intended for some other purpose than that of trying to eat his way out of a cage—the only use he seemed to make of them besides masticating soft fruits. Moreover, he had other peculiarities, *e.g.*, singularly large naked ears, directed forward as if for offensive rather than defensive purposes; then again the second finger of the hands is unlike anything but a monster supernumerary member, it

being slender and long, half the thickness of the other fingers, and resembling a piece of bent wire. Excepting the head and this finger, he closely resembles a Lemur. Now, as he attacked every night

FOREST SCENE IN MADAGASCAR.

the woodwork of his cage, which I was gradually lining with tin, I bethought myself of tying some sticks over the woodwork, so that he might gnaw these instead. I had previously put in some large branches for him to climb upon; but the others were straight sticks to come over the woodwork of his cage, which alone he attacked. It so happened that the thick sticks I now put into his cage were bored

in all directions by a large and destructive grub called here the Montorek. Just at sunset the Aye-Aye crept from under his blanket, yawned, stretched, and betook himself to his tree, where his movements were lively and graceful, though by no means as quick as those of a Squirrel. Presently he came to one of the worm-eaten branches, which he began to examine most attentively; and bending forward his ears and applying his nose close to the bark, he rapidly tapped the surface with the curious second digit, as a Woodpecker taps a tree, though with much less noise, from time to time inserting the end of the slender finger into the worm-holes as a surgeon would a probe. At length he came to a part of the branch which evidently gave out an interesting sound, for he began to tear it with his strong teeth. He rapidly stripped off the bark, cut into the wood, and exposed the nest of a grub, which he daintily picked out of its bed with the slender tapping finger, and conveyed the luscious morsel to his mouth. I watched these proceedings with intense interest, and was much struck with the marvellous adaptation of the creature to its habits, shown by his acute hearing, which enables him aptly to distinguish the different tones emitted from the wood by this gentle tapping, his evidently acute sense of smell aiding him in his search; his secure footsteps on the slender branches to which he firmly clings by his Quadrumanous members; his strong Rodent teeth enabling him to tear through the wood; and, lastly, by the curious slender finger, unlike that of any other animal, and which he used alternately as a plexímeter, a probe, and a scoop. But I was yet to learn another peculiarity. I gave him water to drink in a saucer, on which he stretched out a hand, dipped a finger into it, and drew it obliquely through his open mouth; and this he repeated so rapidly that the water seemed to flow into his mouth. After a while he lapped like a Cat; but his first mode of drinking appeared to me to be his way of reaching water in the deep clefts of trees. I am told that the Aye-Aye is an object of veneration at Madagascar, and that if any native touches one he is sure to die within the year; hence the difficulty of obtaining a specimen. I overcame this difficulty by a reward of ten pounds."

Further information on the same subject was obtained by M. Vinson, who states that his Aye-Aye slept the greater part of the day, and moved about and made attempts to escape at night time. Having once succeeded, it climbed to the nearest tree, and moved about, leaping from branch to branch with the agility of the Ring-tailed Lemur; but its ordinary life in captivity suggested the idea of its being an indolent and rather slow-moving animal. The tail is carried in a curve, with the hollow of the bend downwards, so that it is slightly arched, and its chief office seems to be to add to the warmth of the already warm fur when the animal is in repose. In assuming the attitude of rest, the Aye-Aye places its head between its hands, and bends the tail over it by curving it forwards and letting it fall. Then it rolls itself into a ball, and covers the whole surface with the bushy hairs of this useful appendage, which is longer than the whole body and head together.

With regard to the Aye-Aye mentioned by Dr. Sandwith, Owen advised that, if it could not be sent safely to England, it had better be killed by chloroform, and sent over in spirit. Before this advice arrived the animal managed to escape from its confinement, and made for the sugar-canes in a neighbouring plantation, and there the unlucky Aye-Aye was speedily captured. He was martyred for the sake of science, and its description by Owen will last as long as literature, and its skin and bones as long as the British Museum exists. Some other observers had interested themselves about the animal in the interval, and in 1855 M. Liénard is said by Owen to have observed the habits of a young male. This one liked mango nuts, and invariably made a hole in the rind with his strong front teeth, inserted therein his slender middle digit, and then lowering his mouth to the hole, put into it the pulp which the finger has scooped out of the fruit. When one hand was tired it used the other, and often changed them. On presenting him with a piece of sugar-cane, he held it by both hands, and tearing it open with his teeth, sucked out the juice. M. Vinson had one for two months, which was brought from Madagascar to the Ile de la Réunion, and he stated that it selected the grubs it liked best by the sense of smell, and that when *café au lait* or *eau marée* was offered, it drank by passing its long slender finger from the vessel to the mouth with incredible rapidity.

The Aye-Aye, according to the discovery of M. Soumagne, honorary consul of France in Madagascar, constructs true nests in trees, which resemble enormous ball-shaped "birds'-nests." He found them in the belt of forest which is situated half-way up a great mountain close to the town of Tamative. They are composed of the rolled-up leaves of the so-called "Traveller's Tree," and are lined with small twigs and dry leaves. The opening of the nest is narrow, and is placed on one side,

and it is lodged in the fork of the branches of a large tree. In this the Aye-Aye resembles the lower Lemuroids, and not the genera *Loris* and *Tarsius*.

The specimen of the Aye-Aye examined by Owen is three feet in length, the included tail measuring one foot eight inches and a half, and the fourth fingers of the hand and the fourth toes are the longest. The forefinger is shorter than the fifth, or little finger, and the second toe, counting the toe-thumb as the first, is shorter than the little toe.

The Aye-Aye is admirably adapted for its peculiar life, although part of its construction is very unlike that of the other Lemuroids, whose habits are much the same. Having nocturnal habits, the eyes are especially formed for the purpose of admitting all the light possible. They are large, prominent, and none of the "white" or conjunctiva is seen, only the cornea and the light brown or hazel-coloured iris behind it (commonly called the "sight") being visible. It is a very staring, open eye, and the pupil is capable of being widely opened in the dark, and in fact it dilates generally as the light wanes, so as to admit every possible ray. In daylight, on the contrary, it contracts to a pin's point in size, so as to shut out the light which would dazzle the eye and probably produce injury to it. There is a tapetum (see page 214) which assists in nocturnal vision. Nature has protected the eye not only with lids, for there are traces of eyelashes on the upper one but not on the lower, under which, however, there are some bristles. There is a kind of eyebrow in the form of tufts of a dozen very slender bristle-like hairs, and to complete the arrangement for protecting the eye against direct injury, and for letting the animal know when things are near enough to injure its organ of sight, there is what is called a nictitating fold in each eye. This is a layer of the white of the eye, or conjunctiva, situated close to the inner side near the nose, and which extends when required over the "sight" as a cover and protection. In addition to the nocturnal sight, the Aye-Aye has evidently extremely delicate hearing, the ears being large, spoon-shaped, and open, and their sense is very acute. For, either by hearing or by their very fine sense of smell, it detects grubs in the wood, and soon has them out, thanks to its teeth and claws.

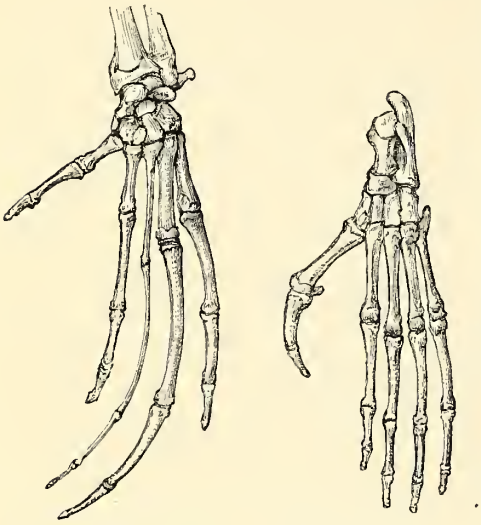
The feet are long, and are made for grasping and for supporting the Aye-Aye on boughs whilst it uses its hands and teeth. They are very strong, and have a very long ankle, and claws to all the toes, except to the great thumb-like toe, which is very powerful, and has a flat nail. But it is in the hands and teeth that the singularity of the animal is made manifest, which makes it so little like the Lemuroida as a group. The hand is unique, but the front of the skull and the front teeth resemble those of the gnawing animals, and hence the name Cheiromys, which means hand-rat. Something has been said already regarding the food of the animal, and as its nature has to do with the hands and teeth, it is advisable to quote the able Superintendent of the Zoological Gardens, Mr. Bartlett:—

"In feeding," writes Mr. Bartlett, "the left hand only is used, but the examination of the mode of taking her food requires careful attention, owing to the very rapid movement of the hand. The fourth finger, which is the largest and longest, is thrust forward into the food; the slender third finger is raised upwards and backwards above the rest, while the first finger (or thumb) is lowered so as to be seen below and behind the chin. In this position the hand is drawn backwards and forwards rapidly, the inner side of the fourth finger passing between the lips, the head of the animal being held sideways, thus depositing the food in the mouth at each movement. The tongue, jaws, and lips are kept in full motion all the time. Sometimes the animal will advance towards the dish and lap like a Cat, but this is unusual. The skeleton-like third finger is used with great address in cleansing her face and picking the corners of the eyes, nose, mouth, ears, and other parts of the body, and during these operations the other fingers are closed." From all that has hitherto been observed, the Aye-Aye evidently eats both insects and vegetable food, so that in captivity it will reject meat food more or less. In its natural state it will prefer the grubs of some trees to those which frequent others, and it searches along the boughs for some evidence of their presence, and, with teeth and slim fingers, opens their galleries and brings them to light.

The teeth are certainly remarkable. There are two sets, the milk teeth and the adult teeth. In the first, or milk teeth, there are two front teeth, one canine tooth, and a molar or grinder on each side of the upper jaw. In the lower jaw there is but one front tooth, no canine, and one molar on each side. A further peculiarity consists in the falling out of the molars, one incisor, and the canine in the upper jaw, to be replaced by the following adult dentition, or second set. This

consists of one incisor, no canine, one pre-molar, and three molars on both sides of the upper jaw; while below, the canine and pre-molar are entirely absent, the incisor and molar being like those of the upper jaw; it has thus eighteen teeth altogether. There are two front teeth in the upper and two in the lower jaw only, but they are very large, long, and narrow, being shaped like those of a Rabbit or Rat. Their tips wear away and expose a sharp cutting surface of thick enamel in front, and they are splendid cutting chisels. They gnaw and cut away wood, strip off bark, and make deep holes in the branches, and their length permits them to be placed in hollows in the wood so as to prize them open by acting as levers. It appears that they are made to grow from their sockets as they are worn down by frequent use. They are by themselves, and there is a great gap (diastema) or distance in the gums between them and the next teeth. This is quite after the fashion of the gnawing animals. The back teeth crush and champ fruit, vegetable substances, and insects with ease. There is a curious point about the chin, for there is no bony union there between the two sides of the lower jaw; on the contrary, the union is by a more or less elastic tissue, which permits of some movement up and down and from side to side during the action of the great front teeth.*

The hand is most peculiar, for certain of the fingers are so thin and long that they appear as if improperly nourished. They have the usual number of joints, and the last joints have strong curved claws. They have not the same relation of length and size as in any of the other Lemuroids, for the fourth finger is the longest instead of the third, and the third finger is so much more slim than the others, that Owen remarks that it seems as if it were paralysed. The hair is carried down the arms to the fingers, and adds to their spidery look. In the wrist there are the usual nine bones, the intermedium being there in addition to the eight recognisable in the higher Apes; and the two bones of the fore-arm greatly resemble those of the Monkeys in general.



BONES OF THE HAND AND FOOT OF AYE-AYE.
(*After Owen.*)

The wrist and fore-arms are very movable, and the fingers also; but the thumbs, small as they are, and clawed, have but little of the thumb-like motion, and are but very slightly opposable to the forefinger, which, moreover, is rather shorter than the "little" or fifth finger.

On the whole the Aye-Aye presents some resemblance to the Lemuroids, and less to any other animal. Its large open ears, the eyes looking straight forward, the nostrils placed at the end of the snout, the want of any groove on the upper lip, the nature of the fur, so furry below and hairy above on the skin, are interesting to those who care to compare this animal with the Lemuroids and Rodents, or gnawing animals; so are the perfect condition of the orbits, or eye cavities, in front and their opening through behind, and the arrangement of the back-bones and limbs to those who would compare it with the Monkeys.

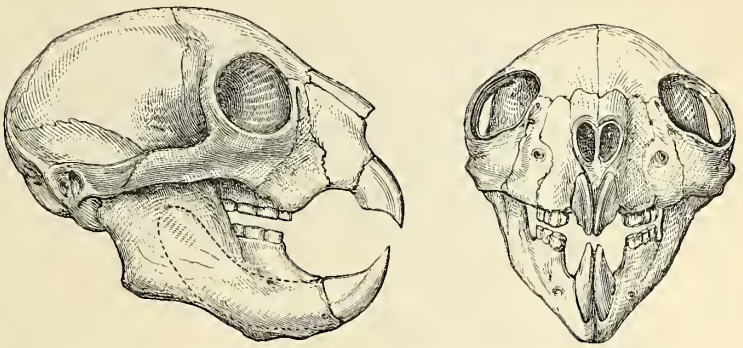
The skeleton resembles that of these last, and there are so many points of difference from the Rodents—although the skull at first sight looks like that of a Rat—that this very exceptional creature is classified with the Lemuroida from its partial resemblance to them and the Monkeys.

THE CLASSIFICATION OF THE LEMUROIDA.

Now that the Madagascar, African, and Asiatic Lemuroids have been noticed, and their prominent peculiarities described, it is easy to arrange them in the proper classification. Firstly, the

* The formula of the milk set is—I. $\frac{4}{2}$, C. $\frac{2}{0}$, M. $\frac{2}{2}$, = 12. That of the permanent set is—I. $\frac{2}{2}$, C. $\frac{0}{0}$, P. M. $\frac{2}{0}$, M. $\frac{6}{6}$ = 18. Professor Peters of Berlin moreover states his having found in a very early stage of development in the Aye-Aye, rudimentary teeth yielding a milk dentition—I. $\frac{6}{2}$, C. $\frac{2}{0}$, M. $\frac{6}{2}$ = 18.

position of the whole sub-order is next to the Hapale Monkeys of South America in the order of Primates. Then, if the figures or stuffed specimens of an Aye-Aye, a Tarsius, and a Slow Loris be compared, there is no difficulty in distinguishing them, for they differ much. But if a Lepilemur and a Galago are compared, it will be noticed that although they differ enough to be placed in two genera, still the distinction is not great. So it is advisable to group them together in a family; but the three others must belong each to a separate family. The scheme of Professor Mivart, who has paid much attention to these animals, and which we adopt, is as follows:—



SKULL OF THE AYE-AYE (SIDE AND FRONT VIEW). (*After Owen.*)

FAMILIES OF THE SUB-ORDER LEMUROIDA AND THEIR GENERA.*

	Genera.
Family I.—Lemuridæ	Indris. Lepilemur. Lemur. Hapalemur. Cheirogale. Galago.
Family II.—Nycticebidæ	Perodicticus. Loris, or Stenops. Nycticebus. Arctocebus.
,, III.—Tarsidæ	Tarsius.
,, IV.—Cheiromydæ	Cheiromys.

As groups these have more or less well-defined differences. Thus, the Lemuridæ have no *rete mirabile*, and, except in one species, the tail is large, and all have their hind legs longer than their front ones.

The Nycticebidæ have short ears and faces, and the tail is short or absent. They have a strange defect in the fingers (of hand and foot), the ankle is short, and there is a *rete mirabile*.

As a family the Tarsidæ have long ears, a long ankle, a long and slender tail, and there is a *rete mirabile*. Moreover, the fourth finger is not the longest.

The Cheiromydæ are known at once by their great front teeth, and the probe-like middle finger of the hand.

GEOGRAPHICAL DISTRIBUTION.

All the kinds of Indris, Lepilemur, Hapalemur, Lemur, and Cheirogaleus inhabit Madagascar and some of the small islands close to its coast, and one kind of Lemur is found in one if not in two of the Comoro Islands, which are between the north-west of Madagascar and the African coast, and nearer the island than to the continent. They have not been discovered elsewhere, and this is extremely interesting, because, with the exception of the genus Galago, they form the entire family of the Lemuridæ. The Galagos are not found in Madagascar, but in the woods and forests of the opposite

* The simplicity of this classification is its great merit. The student will, however, find many other genera mentioned in books or placed before the specific names in museums. Thus, the beautiful Lemuroids in the British Museum of our genus Indris are called Propithecus, when the animals have tails, and the genus Lemur is termed *Varecia*. The genus Galago includes the animals called by some zoologists *Otolicnus* and *Otogale*, &c.

coast of Africa. Some Galagos are found as far south as Port Natal, and the thick-tailed species inhabits both the eastern and the western coasts of the continent, and the central parts also. Others have been found near the Gaboon and in Fernando Po, Senegal, and Gambia, and in the country of Sennaar and near the White Nile. The Aye-Aye is essentially a Madagascar form. The Nycticebidan family has a wide geographical range. Thus, the species of the genus Loris are found in Ceylon, in Southern India at Pondicherry, and in Hindostan; the genus Nycticebus has one species in Borneo and Sumatra, a second in Java, and a third in China. On the contrary, the remaining genera, Perodicticus and Arctocebus, are limited to the west coast of Africa, none of them being found in the intermediate regions of that continent or in Madagascar. Finally, the Tarsidæ, according to Wallace, inhabit Borneo, Celebes, and some other neighbouring islands, the species being the same in all localities. How is the widespread distribution of the animals of the sub-order to be explained? On the presumption that they all sprang from one parent stock, it is necessary to suggest the occurrence of vast geographical changes in bygone ages, such, for instance, as the former connection of Madagascar and the mainland of Africa, and their separation; the former existence and subsequent subsidence of a vast tract of land between Hindostan and Africa, north of and remote from Madagascar; and the former continuity of land where there are now the islands of Borneo, Sumatra, and Java. It is necessary also to assume that Ceylon was united to Hindostan; and the great islands just mentioned to the continent of Asia. The land which was intermediate between Hindostan and Africa has been called Lemuria by Dr. Sclater, and its theoretical existence explains the otherwise incomprehensible presence of Giraffes and Hippopotami, now purely African genera, in the olden time in Asia. Geology rather favours these views. The first Lemuroida swarmed amongst the forests of these vast countries, and their descendants cut off from each other by geographical changes are now limited to very remote localities.

The fossil remains of Lemuroida, or of animals whose skulls resemble somewhat those of the sub-order, have been found in the Eocene of the Western territories, of the United States, and also in the south of France.

The particular muscles of the hand, arm, and shoulder which characterise the Monkeys, and which have been described in the former chapters, are found in the Lemuroids; and Murie and Mivart have already shown that in the Lemuroids the muscles agree mainly with those of Monkeys, and others bear certain resemblances to those of animals lower in the scale. Moreover, the Lemurs possess a unique band of fleshy fibres, which stretch between the shin-bone and the adjoining small bone of the leg, which would seem to serve in aiding the turning of the limb (the rotator fibulæ).

James Murie.
P. Martin Duncan.

MARSH BAT. (*One-half natural size.*)

ORDER II.—CHIROPTERA, OR WING-HANDED ANIMALS.

THE BATS.

CHAPTER I.

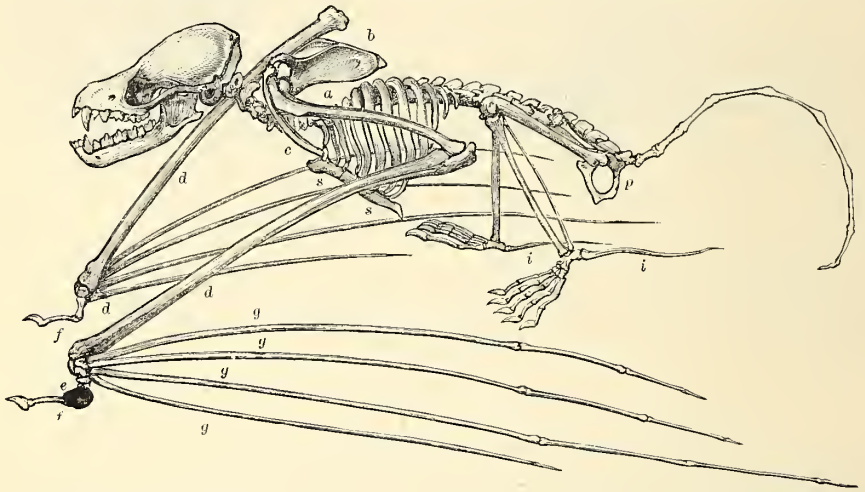
INTRODUCTION.—CLASSIFICATION OF BATS.—THE FRUIT-EATING BATS.

One of Æsop's Fables—Opinions of the Ancients regarding Bats—Scaliger's Statement of the Puzzle—Opinions of the Middle Ages—The True Position of the Bats—The Wing of the Bat—General Structure: The Breast-bone, Arms, Fingers, "Wing-membrane," Wings, Skull, Ribs, Pelvis, Legs—In Repose—Walking—The Teats—Organs of the Senses—"Blind as a Bat"—The Eyes—Spallanzani's Experiments—The Bat's Power of Directing its Flight in the Darkest Places—Their Food—In Winter-Quarters—A Battue of Bats—FRUGIVOROUS AND INSECTIVOROUS BATS.

ONE of those ancient fables ascribed to Æsop, which were the delight of our younger days, contains a description of a battle between the birds and the beasts. The grounds of the quarrel we do not remember, and indeed the moral of the fable was tacked on to the conduct of the Bat. Availing himself of his combination of fur and wings, that astute animal hovered over the field of battle, and took his place on one side or the other, according to the direction in which the tide of success appeared to be turning, with the purpose, of course, of claiming in any case to be on the side of the victors. But this finesse was unsuccessful; the traitor was scouted by both parties, and has ever since been compelled to make his appearance in public only at night. Passing over the ingenious explanation thus afforded of the nocturnal habits of the Bats, this fable reflects pretty clearly the state of uncertainty in which the ancients were as to their precise nature. The union of a Mouse-like body with long wings was a great puzzle to people who had no sound principles of natural history classification to go upon; and even among the naturalists of antiquity there was much doubt as to the true position to be assigned to animals so singularly endowed. Aristotle seems to have thought they were birds with wings of skin; and Pliny describes them as the only birds which bring forth their young alive and suckle them. Among the Jews it is perfectly clear that the Bat was reckoned a bird; it is distinctly included among the unclean fowls in Leviticus (xi. 19), and Deuteronomy (xiv. 18). The obfuscation displayed by ancient writers with respect to the Bat is well shown in the following passage, in which Scaliger summarises their opinions:—"It is indeed," he says, "an animal of marvellous

structure; biped, quadruped; walking, but not with feet; flying, but not with feathers; seeing without light, in the light, blind; it uses light beyond the light, but wants light in the light; a bird with teeth, without a beak, with teats, with milk, bearing its young even when flying." Can it be wondered at that such a creature should be a puzzle?

Nevertheless, some ancient writers seem to have entertained clearer notions on the subject, such as Macrobius, who maintained that as the Bat walked like a quadruped it ought to be classed with quadrupeds, for which he is blamed by Jonston, who speaks with approval of Plato's opinion, according to which this unfortunate animal is neither bird nor beast, an opinion which partially prevailed to a rather late date. Throughout the Middle Ages, however, the general opinion even of professed naturalists was that Bats were birds; and we find this notion prevailing down to the time of Aldrovandus, in the latter part of the sixteenth century, and of Jonston, whose gigantic compilation was published in 1657. It is a question whether this notion that Bats are birds has even yet been entirely dispelled in the popular mind, and no doubt many people still regard them as birds, because they



SKELETON OF THE MOUSE-COLOURED BAT (VESPERTILIO MURINUS.) (*From De Blainville*).

a, humerus; *b*, shoulder-blade; *c*, collar-bone; *d*, fore-arm (radius, with the ulna at the elbow); *e*, wrist-bones (carpal-bones); *f*, thumb; *g g*, metacarpal bones; *s s*, breast-bone (sternum); *p*, pelvis; *i i*, heel-spur.

can fly, just as Whales and Seals are considered fishes, because they swim, and Centipedes and Scorpions reptiles, because they crawl. John Ray, the father of modern zoology, writing in 1683, was the first to refer the Bats to their true position among the Mammalia (animals which suckle their young), and in this course he was followed by Linnæus, who actually placed these puzzles of former naturalists in his highest order of Mammals, the Primates, along with man and the Apes. The position assigned to them by Linnæus in the series of animals they have virtually retained in nearly all systems to the present day.

By all modern zoologists the Chiroptera have been regarded as a distinct order of the Mammalia, characterised especially by their possession of the power of flight, and the consequent modification of the structure of their fore-limbs, which is indicated in the name given to the group (Chiroptera—hand-wings). They are, in fact, the only true flying Mammals, and, indeed, the only truly flying Vertebrates except birds, for the so-called flying Squirrels, flying Lemurs, and flying Opossums are only furnished with a broad fold of skin on each side of the body, which, when expanded by the spreading of the limbs, acts as a sort of parachute to sustain them for a time in the air. This is also the case with the flying Dragons, although in them the membrane is stiffened by means of a portion of the ribs; and even in the flying fishes, in which the organs of aerial locomotion are formed by the fore-limbs, these merely sustain the fish in the air for a time by the increased surface they give it, but do not serve as real wings, like those of Bats and birds.

There is, however, an important difference in the structure of the wing in the Bats and birds,

although the general principle on which the organs of flight are constructed is the same. In both (as indeed also in flying insects), this principle consists in having a strong framework, to which an up and down movement can be communicated, along the front of the wing, enabling it to strike the air with more or less force during its downward passage, whilst the effective surface of the organ is of a flexible or elastic nature, being formed in the bird by the long feathers which are implanted in the skin clothing the bones of the wing, and in the Bat by a thin leathery membrane which is stretched between the bones of the fore and hind limbs. Upon these leathern wings the Bats flit about noiselessly in the twilight or in the darkness of the night. They are able to advance with considerable speed, and also to turn and wheel about in their course with great facility.

Of course, as in birds, the principal modification of structure exhibited in these animals is connected with their power of flight, and manifested in the fore-limbs. These, although most disproportionately developed, still, however, display the same bones which have been described in the arms of the Monkeys and Lemurs, as will be seen in our figure of the skeleton of the European Mouse-coloured Bat. We find in them a strong humerus (*a*) of moderate length, articulating with large shoulder-blades (*b*), which cover a considerable portion of the back of the chest, and are kept apart by well-developed collar-bones (*c*), springing in front from a breast-bone (sternum, *s*), which, although distinctly showing Mammalian characters, projects in such a manner as to serve the purpose of the deep keel in the breast-bone of birds, and give attachment to the powerful muscles required to set the wings in motion (see accompanying figure). The humerus is followed by the bones of the fore-arm (*d*), the radius and ulna, of which, however, the latter is generally very small, and reduced to a mere rudiment immovably fixed to the radius towards the end nearest the body. This section is the longest part of the arm, and the simplicity of its structure is in connection with the fact that, as in birds, there is here no occasion for any movement of rotation in the arm, such as enables the fore-limbs of many Mammals to be applied to a variety of uses. At the extremity of the radius are the carpal or wrist-bones (*e*), which are small but numerous, and furnish surfaces for the articulation of the bones of the fingers. Of these, the first, or thumb (*f*), is short, and composed of three joints, a metacarpal and two phalanges, the last of which bears a strong curved claw, of great use to the animal in clinging to various surfaces, and in walking on the ground. Of the other four fingers, the metacarpal bones (*g*) are very long and slender, forming, indeed, the greater part of the fingers; they taper towards their tips, but at the tips themselves are slightly enlarged. The first, or index finger, in most Bats is composed of the metacarpal bone alone, but in some this is followed by two short phalanges. The other fingers possess either two or three phalanges. In general only the thumb possesses a claw, but in some Bats there is one also on the index finger.

THE STERNUM OF FLYING FOX (PTEROPUS).

To convert this framework into an organ of flight its various parts are, as already stated, united by a membrane of more or less leathery appearance, although often so thin and delicate as to be somewhat translucent. It is an expansion or wide fold of the skin of the body like those forming the parachutes of the flying Squirrels, &c., and often called by the same name—*patagium*. We shall employ the simple, if rather longer term, "wing-membrane." The bones of the arm, with their accompanying muscles, and those of the fingers, are enclosed between the two layers of skin of which the membrane is composed, and which they serve to extend and support. In front of the arm there is a small portion of membrane filling up the angle of the elbow, and called the antebrachial membrane. The thumb is left free. Behind the arm is the great expanse of the wing, which springs from the sides of the body, and is also attached to the hind legs, generally extending down to the ankle.

The wings are expanded by the spreading of the fingers, which radiate from the wrist something like the sticks of a fan. The second, or middle finger, which is the longest, runs to the extreme tip of the wing, but before reaching this it generally joins the extremity of the first, or index finger, which thus acts as a sort of stay to it, and the two fingers together form a tolerably stiff support for the outer margin of the wing. The other two fingers (the third and fourth) traverse the wing to its hinder border, where they carry out the membrane into small pointed projections; so that when the

wing is expanded, this border shows two points besides that at the apex of the wing, and three more or less rounded notches, the last of which is between the tip of the fourth finger and the attachment of the membrane to the hinder limb.

In most Bats the membrane does not stop short at the legs, but encloses them after the same fashion as the arms, leaving only the foot and sometimes a part of the shank free. The portion of membrane that passes within the legs, sometimes filling up the whole space between them and enclosing the whole or a part of the tail, sometimes forming only a narrow border to these limbs, is called the interfemoral or intercrural membrane, and the characters furnished by it and its relations to other parts are of great importance in the classification of Bats.

The rest of the structure of these animals may be dismissed in a few words. The skull, and all the other parts of the skeleton, are generally light and delicate in their construction, as might be expected in animals destined to support themselves in the air; but there is no trace of those pneumatic cavities which, in birds, enable the air to penetrate all parts of the skeleton. The jaws are well armed with teeth, which differ in their character in accordance with the food consumed by the animals. The ribs are well developed, and enclose a large chest cavity. The pelvis (*p*) is long, slender, and somewhat bird-like in some respects; the legs are short, generally slender, and articulated in such a manner that when used in walking the knees are directed backwards, like our elbows; the fibula (the second bone in the shank) is usually imperfectly developed, in the same way as the ulna in the fore-arm; and the foot consists of five distinct toes, armed with small but sharp claws, by which the animals suspend themselves from the surface of rocks, walls, and other objects, in the dark retreats to which they retire for their repose. From the heel-bone (*calcaneum*) in most Bats there springs a cartilaginous or bony rod or spur, which is regarded by some zoologists as forming part of the bone itself. This spur, which is often of considerable length, runs along the margin of the interfemoral membrane, which it no doubt helps materially to stretch. When long, and more or less curved, it often causes a projection of the side of the interfemoral membrane, as shown in the figure of the Marsh Bat (p. 259). The tail is very variable in length.

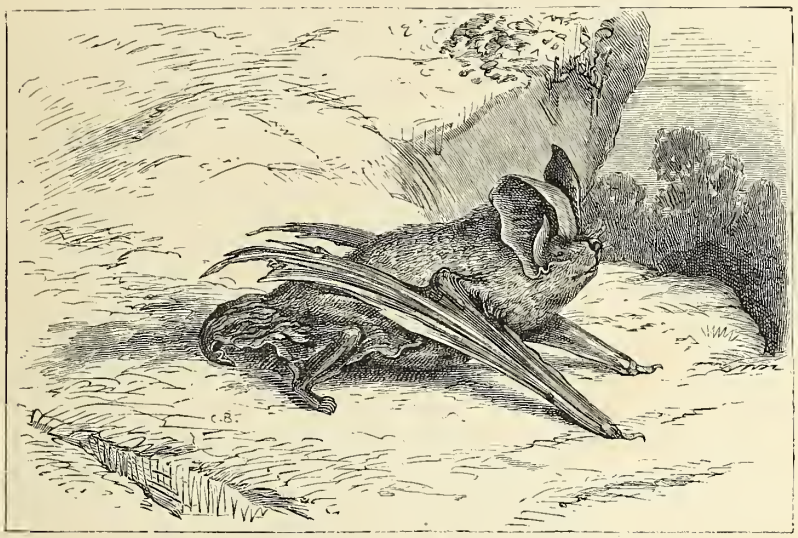
In repose, or rather when not flying, the wings of the Bat are folded up by a reversal of the process by which they were extended for flight; the long fingers are drawn together, and up towards the fore-arm, and the membrane forms leathery folds at the sides of the body. This is also their position when the animal is walking or running on the ground (see the engraving on the next page), which it does in a somewhat awkward fashion, by the action of its hind feet and the claws of its thumbs. When seen thus engaged there can be little doubt as to the quadruped nature of the Bat. Our little European species have a Mouse-like appearance, which fully justifies their old popular name.

The teats are usually situated on the breast; but sometimes they are placed quite on the sides, immediately beneath what we must call the armpits. They are two in number. In addition to these chest or pectoral teats, some species have been described as possessing a second pair of such organs situated on the groin, but recent investigations prove clearly that these are merely nipple-like warts.

The organs of the senses are well developed. The ears are almost always of considerable size, sometimes very large and membranous, and in most cases there is in front of the cavity a sort of lobe of variable form, called the earlet, or tragus, representing the little rounded lobe which, in the human ear, projects from behind the cheek over the opening (see the woodcut of the Head of the Long-eared Bat). The nostrils are either simple slits or apertures at the end of the muzzle, or surrounded by leaf-like organs, often of the most extraordinary forms (see the Head of the Spectacled Vampire, p. 264, and other illustrations later on), in fact, this tendency of the skin in Bats to run out into membranous expansions is one of their most remarkable characteristics, and, from their mode of life, this great development of the skin system would seem to be almost essential to their existence.

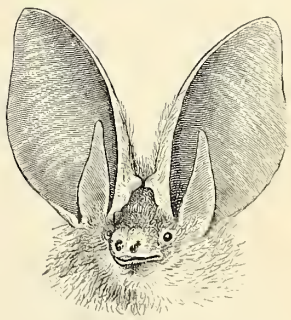
The old proverbial expression, "As blind as a Bat," is certainly not founded on a due appreciation of facts, for Bats are by no means blind; on the contrary, they are furnished with very efficient eyes, although, in most cases, these are little bead-like organs, very unlike the eyes usually seen in animals whose activity is nocturnal or crepuscular. But it would appear that the office of the eyes in guiding these animals is, at all events, supplemented by some other means. Towards the end of the last century, the Abbé Spallanzani made some exceedingly interesting, although certainly cruel experiments on various species of Bats. He blinded these animals, sometimes by burning the eyes with a red-hot

wire, sometimes by removing the organs altogether, and even filling up the orbits with wax, and then allowed them to fly. In spite of the mutilation, the unfortunate little creatures continued quite lively, and flew about as well as those which still retained their eyes; they did not strike against the walls of the room, or the objects in it, avoided a stick held up before them, and showed a greater desire to keep out of the way of a Cat or the hand of a man than to escape contact with inanimate objects. One of these blinded Bats was set free in a long underground passage, which turned at right angles about its middle. It flew through the two branches of this passage, and turned, without approaching



BARBASTELLE WALKING.

the side walls. During its flight it detected a small cavity in the roof at a distance of eighteen inches, and immediately changed its course in order to conceal itself in this retreat. In a garden a sort of cage was prepared, with nets, and from its top sixteen strings were allowed to hang down. Two Bats were introduced into this enclosure, one blinded, the other with its eyes perfect. Both flew about freely, never touching the strings with more than the tips of the wings. Finally, the blind Bat discovered that the meshes of the enclosing net were large enough for it to get through, and made its escape; and, after flying about for a time, made its way rapidly and directly to the only roof in the neighbourhood, in which it disappeared. In a room containing numerous branches of trees, or in which silk threads, stretched by small weights, were suspended from the ceiling, the Bats, though blinded, avoided all these obstacles; and when, after tiring themselves with their aerial evolutions, they settled on some object for the sake of rest, they would immediately rise again on an attempt being made to seize them with the hand.



HEAD OF LONG-EARED BAT.

From these experiments it was perfectly clear that in threading the galleries of caverns and other narrow and pitch-dark places to which Bats commonly resort for their diurnal repose, these animals were guided by some other sense than that of sight, and the worthy abbé set himself to ascertain what this sense might be. He commenced operations by covering the body of one of his blind Bats with varnish, and found that this had no effect in rendering its movements uncertain. He then stopped up the ears with wax, and finally with melted sealing-wax, and still the Bats obstinately persisted in avoiding obstacles placed in their way. Consequently they did not *hear* their way in the dark. There remained the senses of smell and taste. To test the former the nostrils were stuffed up, but the only effect of this operation was to bring the creature speedily to the ground, owing to difficulty of

breathing. Little fragments of sponge impregnated with musk, camphor, or storax were fastened in front of the nostrils, and then the Bats flew about as freely as ever, and showed the same power of avoiding contact with objects in their path. The removal of the tongue, as might be expected, produced no result.

Many of Spallanzani's experiments were repeated by M. de Jurine, of Geneva, and with similar results, although Jurine found that when the ears were effectually stopped the Bats struck their wings against any object that came in their way.

Spallanzani found further that when the head of a Bat was enclosed in a small paper bag, or even wrapped in some fine light stuff, the animal could not be induced to fly. Coupling this observation with the results of his other experiments, he came to the conclusion that the mysterious faculty possessed by Bats of finding their way in the darkest places was due to some special sense with which they were endowed, and which was seated in some unknown organ situated in the head. Cuvier, however, who was the first really to appreciate the results of these experiments, arrived at the conclusion, now generally accepted, that the wonderful power possessed by Bats of directing their flight in places so dark as to render the sharpest eyes useless, was due to an exceptional development of the sense of touch, residing especially in the great delicate membranous expanse of the wings. These organs are really of the most delicate structure, and traversed by nerves, the fine ramifications of which terminate in little loops, like those found in those parts of the skin in man in which the sense of touch is manifested with the greatest perfection; and their surface is covered with rows of small thickened points, or papillæ, which may very probably have something to do with the perception of exceedingly delicate tactile impressions. Further, the wings of Bats are very copiously supplied with blood-vessels, and according to Dr. Wharton Jones even the veins are furnished with contractile walls, so that the circulation of the blood in them must be exceedingly active. In fact, according to Professor St. George Mivart, we have here a condition of things which may be in some degree analogous to a state of inflammation, which would doubtless considerably heighten the sensibility of the parts. But besides the wing-membranes many Bats, as we have seen, possess greatly enlarged ears, and also curious leaf-like and membranous appendages attached to the region of the nose, all of which no doubt partake of the sensibility of the wing-membranes, and assist in no small degree in guiding their possessors. In fact, from some observations recorded in Bell's "British Quadrupeds" with regard to two British species (the Pipistrelle and the Horseshoe Bat), it would appear that the species with nasal appendages show greater acuteness of perception than those with simple noses, and many of them are known to frequent the darkest places of retreat, and to fly later than some of their less highly endowed fellows.

HEAD OF THE SPECTACLED VAMPIRE (STENODERMA PERSPICILLATUM.)

The food of the great majority of Bats consists of insects, which they capture on the wing. The members of one great family, however, and some species of another, feed upon fruits; whilst a few find at least a part of their nourishment in the blood of other animals. They generally fly in the twilight of the evening and morning, retiring to obscure places during the day, although some species will occasionally come out of their concealment by daylight.

In temperate and cold climates they pass the winter in a torpid state suspended by their hinder claws in their ordinary places of daily retreat, where they are often to be found in immense numbers. An American gentleman, describing a cave in the Western Territories, where the excrements of Bats had formed so large a deposit of "guano" that it was proposed to utilise it as manure, was asked by a friend of ours about the number of Bats in the cavern. He said, "Well, I guess when we went in there was about as much Bats as air in it." There is doubtless a slight tinge of occidental hyperbole about this statement, but the following sober details, although also from the Western continent, may serve to show what multitudes of these creatures may collect together when left undisturbed in a suitable haunt. The story is told in the introduction to Dr. Allen's "Monograph of the Bats of North America," and is a description by M. Figaniere, Portuguese Minister to the United States, of the incidents attending his occupation of a new house in May, 1860:—

"The weather," he says, "which was beautiful, balmy, and warm, invited us towards evening to out-door enjoyment and rest, after a fatiguing day of travel and active labour; but chairs, settees, and benches were scarcely occupied by us on the piazza and lawn, when to our amazement, and the horror of the female portion of our party, small black Bats made their appearance in immense numbers, flickering around the premises, rushing in and out of doors and through open windows, almost obscuring the early twilight, and causing a general stampede of the ladies, who fled, covering their heads with their hands, fearing that the dreaded little vampires might make a lodgment in their hair.

"This remarkable exhibition much increased our disappointment in regard to the habitable condition of our acquisition, and was entirely unexpected, inasmuch as the unwelcome neighbours were in their dormant state, and ensconced out of sight when the property was examined previous to purchase.

"Evening after evening did we patiently, though not complacently, watch this periodical exodus of dusky wings into light from their lurking-places one after another, and in some instances in couples, and even triples, according to the size of the holes or apertures from which they emerged in the slate roofing would permit. Their excursions invariably commenced with the cry of the *Whippoorwill*, both at coming evening and early dawn, and it was observed that they always first directed their flight towards the river, undoubtedly to damp their Mouse-like snouts, but not their spirits, for it was likewise observed that they returned to play hide and seek, and indulge in all other imaginable gambols: when, after gratifying their love of sport, and satisfying their voracious appetites (as the absence of Mosquitoes and Gnats testified), they would re-enter their habitation, and again emerge at the first signal of their feathered trumpeter. Thus I ascertained one very important fact, namely, that the Bat, or the species which annoyed us, ate and drank twice in twenty-four hours. Such appeared their habit, such, therefore, was their indispensable need." After trying various remedies, none of which seemed to abate the nuisance, M. Figaniere adopted the following plan:—

"When the Bats' *réveillé* was sounded by the bugle of the *Whippoorwill*, all the hands of our establishment, men and boys, each armed with a wooden implement (shaped like a cricket-bat), marched to the third floor, 'on murderous deeds with thoughts intent.' A lighted lantern was placed in the middle of one of the rooms, divested of all furniture, to allure the hidden foe from their strongholds. After closing the window to prevent all escape into the open air, the assailants distributed at regular distances to avoid clubbing each other, awaited the appearance of the Bats enticed into the room by the artificial light and impelled by their own natural craving. The slaughter commenced, and progressed with sanguinary vigour for several hours, or until brought to a close by the weariness of dealing blows that made the enemy bite the dust, and overpowered by the heat and closeness of the apartment. This plan succeeded perfectly. After a few evenings of similar exercise, in which the *batteurs* became quite expert in the use of their weapons, every wielding of the wooden bat bringing down an expiring namesake, the war terminated by the extermination of every individual of the enemy in the main building. However, there still was the cockloft of the laundry, which gave evidence of a large population. In this case I had recourse to a plan which had been recommended, but was not carried out in regard to the dwelling-house. I employed a slater to remove a portion of the slating which required repairing. This process discovered some fifteen hundred or two thousand Bats, of which the larger number were killed, and the remainder sought the barn, trees, and other places of concealment in the neighbourhood.

"To remove the very disagreeable odour which remained in the upper part of the house, various kinds of disinfectants were employed with some advantage; but the most effectual method resorted to was that of opening holes of about four inches square, two at each gable end, to permit a current of air to pass through. These holes were covered with wire gauze to prevent the re-entrance of any of the remainder of the army of the enemy which might hover around the premises. At the end of five years the odour has now nearly disappeared, being hardly perceptible during a continuance of very damp weather."

The great number of species of Bats which have been described from various parts of the world, but especially from tropical and sub-tropical regions, display two very strongly-marked types of structure, associated in general with very different habits and modes of life. Some are exclusively confined to a

fruit diet, or only consume animal food as an exceptional dainty; whilst the others almost as exclusively find their nourishment in the swarms of insects which everywhere people the air. Of the latter, however, some few feed upon fruits, and others are said to diversify their insect fare by occasionally sucking the blood of other animals, and even of man himself. In the Frugivorous, or Fruit-eating Bats, the crowns of the molar teeth are smooth, with a central furrow running in the direction of the length of the jaw; in the Insectivorous forms, on the contrary, the molars show sharp tubercles separated by transverse furrows, generally producing a sort of W-like pattern on each tooth. These two types of tooth-structure are associated in each case with other characters. The Bats are thus divided into two great groups, generally regarded as sub-orders.

HEAD OF THE KALONG. (*Natural size.*)

CHAPTER II.

SUB-ORDER I.—MEGACHIROPTERA, OR LARGE BATS.

FAMILY I.—PTEROPIDÆ, OR FRUIT-EATING BATS.

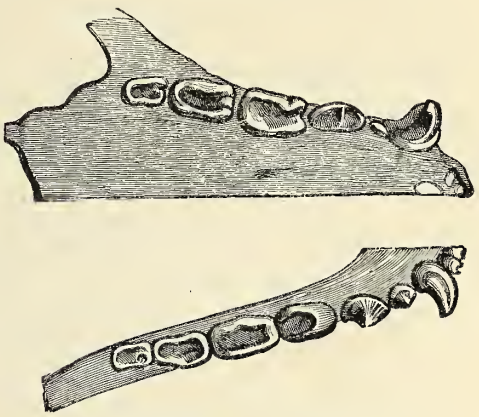
Characteristics of Fruit-Eating Bats—Distribution—Diet—Flying Fox of Ceylon: its Habits, as described by Sir E. Tennent—The Flight of the *Pteropidæ*—Known to the Ancients—The Fruit Bats in the Zoological Gardens—Indian Flying Fox—Diet—Dissipated Habits—Great Kalong—Linnæus's Description—In their Dormitories—Nicobar, Maned, Japanese, and Grey Fruit Bats—Grey-headed Fruit Bat—Gould's Fruit Bat—Roussette—Egyptian Fruit Bat—Hottentot Fruit Bat—Maritime Fruit Bat—Margined Fruit Bat—White's Fruit Bat—Hammer-headed Bat—Harpy Bat—Greater Harpy Bat—Cloaked Fruit Bat—Dwarf Long-tongued Fruit Bat—Black-cheeked Fruit Bat—Fijian Long-tongued Fruit Bat.

The fruit-eating Bats (*Frugivora*, Wagner), called *Megachiroptera*, or Large Bats, by Mr. Dobson, on account of the comparatively large size of most of the species, are characterised by having the face elongated and Dog-like (see above illustration)—whence the name of Flying Foxes is often applied to them by European residents in the countries where they occur)—the ears simple and usually pointed, but with the sides uniting, so as to form a complete ring at the base, the nose without any leaf-like

FRUIT BATS OF CEYLON AT HOME.

appendages, the tail short or altogether deficient, the interfemoral membrane, or the membrane between the legs, which in our ordinary Bats encloses the tail, reduced to very small dimensions, and the molar teeth furnished with flattish crowns, along the middle of which runs a longitudinal furrow (figured below). The free thumb is long, and armed with a strong hooked claw, and the first, or index finger, in nearly all the species, is also terminated by a claw.

The species of Frugivorous Bats, of which about seventy have been described, agree very closely in their general characters, and constitute a single family, to which the name of *Pteropidæ* has been given, derived from that of the oldest and most extensive of its genera, *Pteropus* (wing-foot). They are distributed all over the warmer parts of the Eastern hemisphere and the islands of the Pacific. Wherever they occur, they present nearly the same form, and generally a very similar style of coloration, whilst in their diet they stick most religiously to fruits, for although some have been found in captivity to feed on the flesh of birds and rats, and others are charged with catching and eating fish, in the former case some allowance must be made for the artificial condition of the animal, which probably produced a morbid appetite, heightened by the fact that the supply of his natural food had been exhausted; and the second statement seems to rest exclusively on the observed fact of these Bats on leaving their roosts at sunset skimming close over the surface of water, and sometimes even dipping into it; but the object of these evolutions, as remarked by Mr. Dobson, "is probably, in the first instance, to drink, and, secondly, to rid themselves of some of the numerous parasites with which they are commonly infested." Sir James Emerson Tennent, however, says of the Ceylonese species, that "insects, caterpillars, birds' eggs, and young birds are devoured by them; and the Singhalese say that the Flying Fox will even attack a Tree Snake," but these statements are not confirmed by other writers, and from the reference to the Singhalese, it seems probable that they are founded upon hearsay evidence. Mr. Dobson, however, has suggested that one species (the *Cynonycteris amplexicaudata*) feeds occasionally upon the shell-fish that it finds upon the shore, and in this opinion he is supported by Mr. W. T. Blanford, who found the species upon the island of Kishm, in the Persian Gulf, a spot so barren that he thinks the Bats would starve if they depended upon fruits for their nourishment.



DENTITION OF THE EGYPTIAN FOX-BAT.
Three times natural size.)

The habits of the Flying Fox of Ceylon (*Pteropus medius*) are so well described by Sir James Emerson Tennent, that we may here quote his observations upon that species, especially as they will apply, *mutatis mutandis*, to the members of the family in general. He says:—"They feed, amongst other things, on the guava, the plantain, the rose-apple, and the fruit of the various fig-trees. Flying Foxes are abundant in all the maritime districts, especially at the season when the *pulum-imbul* (*Eriodendron orientale*, Stead.), one of the silk-cotton trees, is putting forth its flower-buds, of which they are singularly fond. By day they suspend themselves from the highest branches, hanging by the claws of the hind-legs, with the head turned upwards, and pressing the chin against the breast. At sunset taking wing, they hover, with a murmuring sound occasioned by the beating of their broad membranous wings, around the fruit-trees, on which they feed till morning, when they resume their pensile attitude as before. [See our full-page illustration.]

"A favourite resort of these Bats is the lofty india-rubber trees, which on one side overhang the Botanic Gardens of Paradenia, in the vicinity of Kandy. Thither for some years past they have congregated, chiefly in the autumn, taking their departure when the figs of the *Ficus elastica* are consumed. Here they hang in such prodigious numbers, that frequently large branches give way beneath their accumulated weight. Every forenoon, between the hours of 9 and 11, they take to wing, apparently for exercise, and possibly to sun their wings and fur, and dry them after the dews of the early morning. On these occasions their numbers are quite surprising, flying in clouds as thick as

Bees or Midges. After these recreations, they hurry back to their favourite trees, chattering and screaming like Monkeys, and always wrangling and contending angrily for the most shady and comfortable places in which to hang for the rest of the day protected from the sun. The branches they resort to soon become almost divested of leaves, these being stripped off by the action of the Bats attaching and detaching themselves by means of their hooked feet. At sunset they fly off to their feeding-grounds, probably at a considerable distance, as it requires a large area to furnish sufficient food for such multitudes.

"In all its movements and attitudes, the action of the *Pteropus* is highly interesting. If placed upon the ground, it is almost helpless, none of its limbs being calculated for progressive motion; it drags itself along by means of the hook attached to each of its extended thumbs, pushing at the same time with those of its hind feet. Its natural position is exclusively pensile; it moves laterally from branch to branch with great ease, by using each foot alternately, and climbs, when necessary, by means of its claws.

"When at rest or asleep, the disposition of the limbs is most curious. At such times it suspends itself by one foot only, bringing the other close to its side, and thus it is enabled to wrap itself in the ample folds of its wings, which must envelop it like a mantle, leaving only its upturned head uncovered. Its fur is thus protected from damp and rain, and to some extent its body is sheltered from the sun.

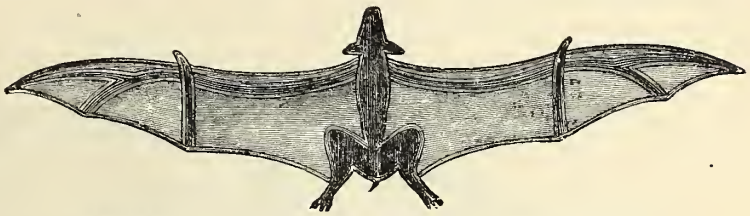
"As it collects its food by means of its mouth, either when on the wing or when suspended within reach of it, the Flying Fox is always more or less liable to have the spoil wrested from it by its intrusive companions, before it can make good its way to some secure retreat in which to devour it unmolested. In such conflicts they bite viciously, tear each other with their hooks, and scream incessantly, till, taking to flight, the persecuted one reaches some place of safety, when he hangs by one foot, and grasping the fruit he has secured in the claws and opposable thumb of the other, he hastily reduces it to lumps, with which he stuffs his cheek-pouches till they become distended like those of a Monkey. Thus suspended in safety, he commences to chew and suck the pieces, rejecting the refuse with his tongue." Sir James Emerson Tennent adds that the Flying Fox drinks by lapping, to do which it suspends itself head downwards from a branch above the water.

The flight of the *Pteropidæ* is strong and direct, although not very rapid, and they often travel considerable distances in search of favourite articles of food. During flight the hind legs are usually stretched out horizontally, and as the space between them is not, as in most other Bats, filled up by an interfemoral membrane, the animals appear as if they had two stiff tails. Their skin exhales a peculiar odour, which has been sometimes described as "musky," although the term is hardly applicable to it. This odour, which is supposed to be due to the contamination of the fur with the urine of the animals, strongly pervades their dwelling-places, and unless great care is taken in skinning them their flesh is said to acquire a corresponding taste, which is a matter of some importance, as the larger species constitute a favourite article of food in the countries which they inhabit.

That the ancients were acquainted with some species of these Bats seems pretty certain, as one of them (*Cynonycteris ægyptiacus*) is common in Egypt, and, in fact, is frequently represented on the monuments of that country (see the engraving on the next page), and Aristotle refers to a tail-less African Bat, which was probably a Flying Fox. The town of Borsippa, in Mesopotamia, is mentioned by Strabo as being haunted by Bats of larger size than any of those known in Europe; and, indeed, that it was so haunted, and that the inhabitants ate these Bats, is nearly all that is definitely known of the town. The species was in all probability either the Egyptian one just referred to, or a nearly allied form (*Cynonycteris amplexicaudata*), which is known still to inhabit Persia. The Mosaic prohibition of the Bat as an article of food to the Jews also no doubt related to one of these species, which may have been commonly eaten in Egypt or in Syria.

Formerly it was considered a matter of considerable difficulty to keep these Frugivorous Bats alive in captivity, and especially to transport them to Europe; but the latter difficulty has disappeared with increased facilities of locomotion, and several species have been exhibited alive in various menageries and zoological gardens. At the present moment the collection of the Zoological Society of London contains examples of three species, namely, the Common Indian Fruit Bat (*Pteropus medius*), the Formosan Bat (*P. formosanus*), and the Collared Fruit Bat of South Africa (*Cynonycteris collaris*).

These animals thrive remarkably well in their rather confined cages in the Monkey House, where, unfortunately, they have no opportunity of displaying their activity on the wing; but the visitor may see their usual attitude in repose, suspended by their hind feet, and with their wings wrapped round them like a cloak, whilst the fact of their curtain being lifted is always sufficient to disturb some of them, and induce them to turn their sharp little noses and bright eyes in the direction of the intruder, and to utter the little querulous cry which seems to indicate their objection to being disturbed. At night, however, they become more active, crawling briskly about their cage, and quarrelling vigorously among themselves for the choice morsels of their food. They also breed freely in their prison (especially the African species). The young African Fruit Bats born in the Zoological Gardens were covered with short, smooth hair of a nearly uniform pale ash-colour, a little darker towards the tips. Only one was produced at a time, and this clung by its hind claws to the lower part of the body of the mother, with its mouth usually attached to one of the two nipples situated on the breast, as shown in the figure on the next page. The young Fruit Bats born in confinement may be brought up, as Mr. Bartlett tells us, to display some fondness for the person who takes care of them and feeds them. They will then, if let loose, crawl about upon him, and even mount upon his shoulder and demonstrate their affection by licking his face after the fashion of a Dog. In the uneducated state, however, they bite viciously.



REPRESENTATION OF A FRUIT BAT ON AN EGYPTIAN MONUMENT.

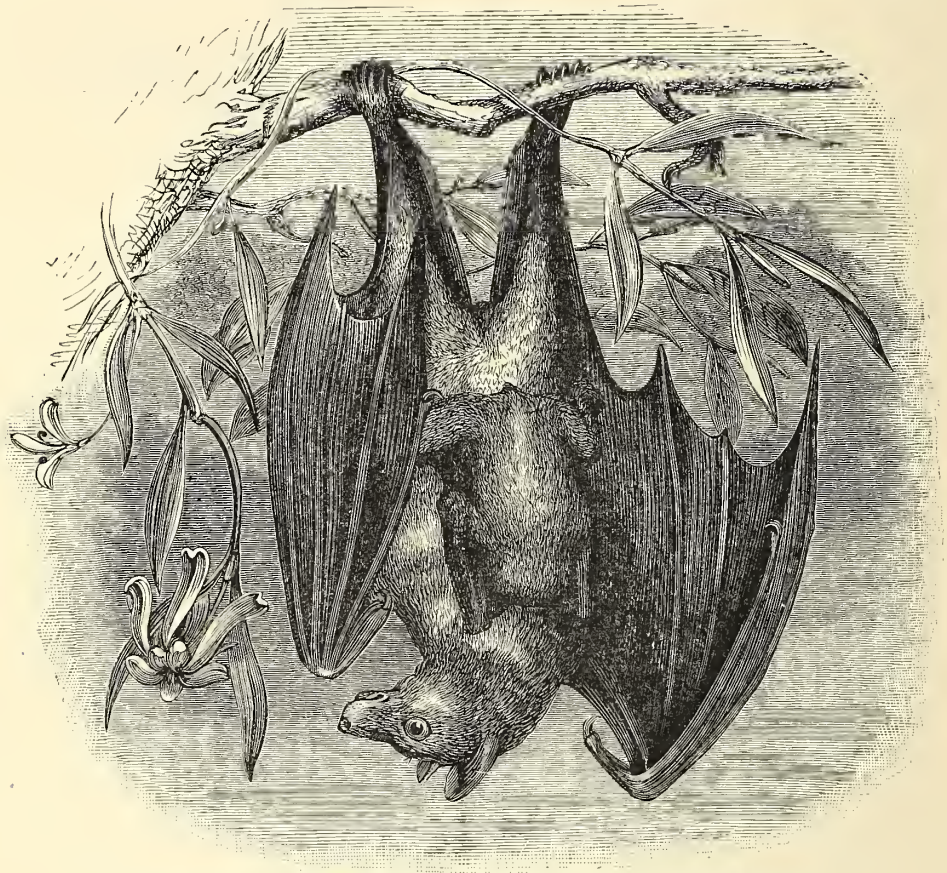
THE INDIAN FLYING FOX.*

Southern Asia and its dependent islands may be regarded as the metropolis of the Fruit Bats. Here the species are most plentiful, and most numerously represented by individuals; it is here also that the largest species occur. One of the best-known is the Indian Flying Fox (*Pteropus medius*), some account of the habits of which, from the pen of Sir James Tennent, has already been given; and this species inhabits the whole of Hindostan, with the exception of the Punjab, Ceylon, Arracan, Tenasserim, and Pegu. It has been described by most writers under the name of *P. Edwardsii*, having been erroneously identified with a species inhabiting Madagascar and South-Eastern Africa. It measures about eleven inches in length,† and more than three feet in expanse of wing. As in all species of the typical genus *Pteropus*, of which it is the sole representative in the Indian peninsula, the tail in *P. medius* is entirely deficient, the tongue is of moderate size, and the molar teeth well developed—five on each side in the upper, and six in the lower jaw; the nostrils project, and are separated by a deep notch; the wing-membranes spring from the sides of the back, and are attached to the back of the first joint of the second toe; and the head and nape of the neck are covered with fur of a different colour from that of the rest of the upper part of the body. The latter is blackish or dark brown, with scattered greyish hairs. The nape of the neck and shoulders, the chest, and upper part of the abdomen are variable in colour from reddish-yellow or straw-colour to dingy rusty brown, the fur of the under surface being darker than that of the nape, and all the light tints darker in the females than in the males. The latter have usually a tuft of stiff hairs, of a light reddish-yellow colour, on each side of the neck. The ears, which are nearly naked, are acutely pointed, with the outer border concave just below the tip; the wing-membrane is dark brown, hairy beneath towards the body.

This species is referred to by nearly all writers on Indian zoology; but their accounts of its general habits agree closely with those given by Sir James Tennent, and already quoted. The Bats feed on fruits of various kinds, except oranges, according to Mr. Jerdon, and besides figs they are especially fond of the annonads, particularly the fruit of *Gualteria longifolia*, the soft parts of which

* *Pteropus medius.* † Colonel Sykes states that he had met with individuals more than fourteen inches long.

they devour, rejecting the kernels, with which the ground under the trees is speedily covered. According to Mr. F. Day, the fruit of the wild almond (*Terminalia catappa*) is also a favourite article of diet with them, and he adds, "they sometimes carry off the almonds into the verandahs of houses, where they extract the kernels, and in so doing frighten nervous people into the belief that robbers are endeavouring to effect an entrance." In search of these and other favourite fruits, they often fly to great distances during the night, returning with the dawn to their sleeeping-places, when a scene of confusion takes place, which has been described as follows by Mr. Tickell :—"From the arrival



COLLARED FRUIT BAT WITH YOUNG. (From the *Proceedings of the Zoological Society.*)

of the first comer, until the sun is high above the horizon, a scene of incessant wrangling and contention is enacted among them, as each endeavours to secure a higher and better place, or to eject a neighbour from too close vicinage. In these struggles the Bats hook themselves along the branches, scrambling about hand over hand with some speed, biting each other severely, striking out with the long claw of the thumb, shrieking and cackling without intermission. Each new arrival is compelled to fly several times round the tree, being threatened from all points; and when he eventually hooks on he has to go through a series of combats, and be probably ejected two or three times, before he makes good his tenure." No doubt these squabbles are rendered more violent by the disgracefully dissipated habits in which the Bats indulge during their nocturnal expeditions, for, according to Mr. Francis Day and other observers, "they often pass the night drinking the toddy from the chatties in the cocoa-nut trees, which results either in their returning home in the early morning in a state of extreme and riotous intoxication, or in being found the next day at the foot of the trees sleeping off the effects of their midnight debauch."

The flesh is said by Colonel Sykes to be delicate, and without disagreeable flavour; but he states that the only persons in Western India who eat these Bats are the Portuguese residents. According to Mr. Jerdon, however, many classes in the Madras presidency also eat them.

THE GREAT KALONG.*

This, which is the largest of all known Bats, is an inhabitant of the great islands of the Eastern Archipelago, especially Java and Sumatra, where it exists in immense numbers. The species is also said to occur in the Philippine Islands and in Malacca. It is nearly allied to the Indian Fruit Bat, but grows to a larger size, attaining a length of about fourteen inches, and an expanse of wing of four feet and upwards. The colour varies considerably, but is generally brownish-black on the back, with the top of the head and the neck reddish-yellow, and tinged with chestnut-brown beneath. The muzzle, ears, and wing-membranes are black; the ears are shorter than in the Indian species, and the outer margin is less concave towards the tip; and the wing-membranes originate on the sides of the body at a greater distance from the centre of the back. Some of the varieties have been described as distinct species; two especially, in which the fur is entirely black, figure in the catalogues under the names of *Pteropus Pluto* and *P. funereus*.

The Kalong (see next page) was the first of the Indian Frugivorous Bats to be made known to European naturalists in modern times. It was described under the name of *Vespertilio admirabilis*, by Bontius, in his "Historia Naturalis Indiæ Orientalis." The species was also described and figured by Seba and other naturalists of the seventeenth century; but Linnæus, by a curious blunder, confused the references to this and allied species with the stories told of the American Vampire Bats, and described these Eastern fruit-eating forms as constituting a species under the name of *Vespertilio vampyrus*, the natural history of which he summed up in the following queer paragraph:—"Noctu haurit sanguinem dormientium servorum, cristas gallorum et lacrymas palmarum, phlebotomus felicissimus in pleuritide!" (By night it sucks the blood of sleeping slaves, the combs of cocks, and the juice of palm-trees, a capital lancet in pleurisy!) In its habits it closely resembles its Indian ally, resorting in great numbers to particular trees for the purpose of sleeping through the day, and starting forth at sundown in search of the fruits on which it feeds. Dr. Horsfield describes them as presenting a singular spectacle in their dormitories. "Ranged in succession with the head downwards" he says, "the membrane contracted about the body, and often in close contact, they have little resemblance to living beings, and by a person not accustomed to their economy are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches." He adds that they occasion "incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut which surrounds every dwelling of the meanest peasantry, to the rare and most delicate productions which are cultivated with care by princes and chiefs of distinction." In his history of Sumatra, Mr. Marsden states that he has observed very large flights of these Bats passing at a great height in the air, as if migrating from one country to another; and he adds that Captain Forrest noticed them crossing the Straits of Sunda from Java Head to Mount Pugong. The flesh of this species is eaten by the inhabitants of the countries where it abounds, who thus get some return for the mischief it does in their gardens and plantations. Its specific name (*edulis*) refers to this circumstance. Its name among the natives of Java is Kalong, and with the Malays of Sumatra and of the peninsula of Malacca Kaluwang, or Kluang.

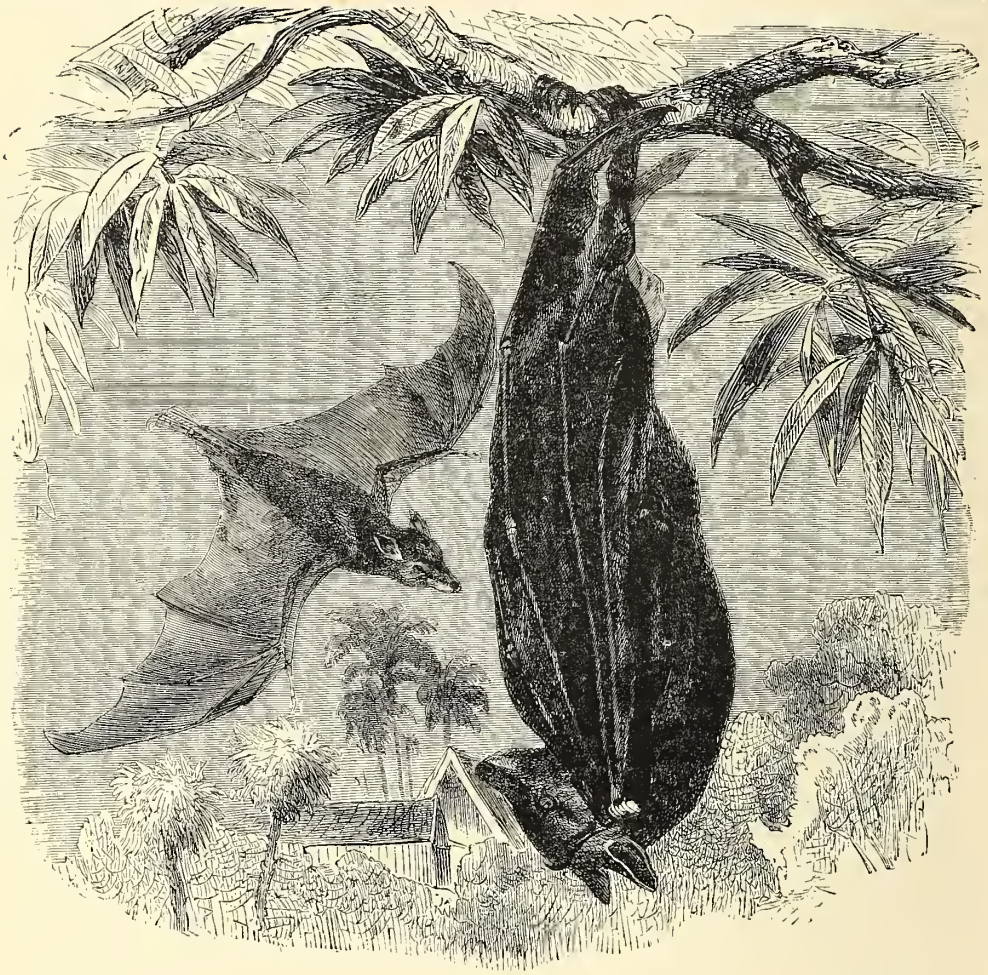
THE NICOBAR, MANED, JAPANESE, AND GREY FRUIT BATS.†

It will be unnecessary to do more than refer to a few of the numerous species of *Pteropus* inhabiting the islands of the Eastern seas, as their habits in all cases are almost exactly alike, and it would be useless to attempt the bare description of a number of closely-allied species. The Nicobar and Andaman Islands in the Bay of Bengal have their peculiar species (*P. nicobaricus*), about the same size as the Indian Fruit Bat, but of which the females and young males are usually black all over,

* *Pteropus edulis.*

† *Pteropus nicobaricus, jubatus, dasymallus,* and *griseus.*

whilst the male has a reddish or chestnut-coloured tippet. The Philippine Islands have a rather remarkable species, the Maned Fruit Bat (*P. jubatus*), the head of which is shown in one of our illustrations on the next page. Japan possesses a smaller form (*P. dasymallus*), about eight inches long, and which is characterised by the woolly nature of its fur, as indicated in its specific name. Those islands of the Eastern Archipelago from Celebes to New Guinea and the Solomon Islands which, according to Mr. Wallace, belong to the great Australian region, are abundantly supplied with fruit-



KALONG.

eating Bats, such as the Grey Fruit Bat (*P. griseus*, see next page), a small species which inhabits Timor and Amboyna. The small islands scattered over the ocean to the east also possess their peculiar species.

THE GREY-HEADED FRUIT BAT.*

The northern and eastern parts of Australia are inhabited by a large species of *Pteropus*, the Grey-headed Fruit Bat (*P. poliocephalus*). This Bat measures about a foot long, and has an expanse of wing of about three feet. The head, cheeks, and throat are ash-grey, with a few scattered black hairs; the nape, part of the front of the neck, and the shoulders are bright reddish-brown, and separated by a black band from the grey fur of the body. These Bats, according to Dr. Bennett, are found in

* *Pteropus poliocephalus.*

great numbers about Moreton Bay and the northern districts of New South Wales. They could be observed "hanging in dense clusters from the uppermost branches of the lofty gum and other trees, which often bend so much under the weight, that the spectator is in momentary expectation of their breaking off with a crash, and falling to the ground encumbered with their heavy load of Bats." The same observer remarks that, although their regular activity is crepuscular and nocturnal, they occasionally seek food for a short time during the day, and he adds when seen flying about the trees in the daytime they resemble rooks so closely as to have been frequently mistaken for those birds. Since the cultivation of fruit has been carried on extensively in New South Wales and Queensland, these Bats have been found to do a vast amount of injury to the plantations.

Mr. Gould, speaking of this Bat, says, "The enormous number that may be seen sleeping pendant from the trees in the more secluded parts of the forest are beyond conception. It is not surprising, therefore, that the settlers whose abodes may be in the neighbourhood of one of these colonies should find their peach-orchards devastated in a single night. Indeed, no one of the native animals is more troublesome to the settlers than this large Bat, which, resorting to the fruit-grounds by night, when it is impossible to protect them from its attacks, commits the most fearful havoc." Like the Indian species, this Bat is exceedingly fond of the wild fig.

HEAD OF THE MANED FRUIT BAT. (*Natural size.*)

HEAD OF THE GREY FRUIT BAT. (*Natural size.*)

GOULD'S FRUIT BAT.*

Mr. Gould described and figured from Northern Australia a large species of Fruit Bat of a sombre colour, with a reddish-brown neck-spot, which he identified with the *Pteropus funereus* of Timor, a supposed species which is now regarded as a mere colour-variety of the Great Kalong. The Australian Bat is described by Professor Peters as a distinct species under the above name. It is about nine inches in length. We have the following observations upon its mode of occurrence and habits:—Mr. Gilbert found it to be extremely abundant in the Coburg peninsula. During the day the Bats were seen suspended in great numbers from the upper branches of the mangroves overhanging the creeks. They constantly emit a very strong and disagreeable odour, which is perceptible at a considerable distance. At night they become exceedingly active, and while flying about in quest of food they utter a loud, trembling, but shrill whistle.

Dr. Leichardt, in his expedition from Moreton Bay to Port Essington, found this Bat an excellent article of food. According to him it feeds upon fruit and the honey of various flowers. After it had fed upon the flowers of the so-called tea-tree, he found it to be unusually fat and delicate; while those Bats which had been revelling among the blossoms of the gum-trees were not so fat, and had a strong unpleasant odour. In the neighbourhood of the River Roper the Bats occurred in myriads, suspended in thick clusters on the highest trees in the shady and moist parts of the valley. They started from their repose as the travellers passed, and the flapping of their great leathery wings produced a sound like that of a hail-storm.

* *Pteropus Gouldii.*

THE ROUSSETTE.*

The so-called Mascarene Islands, Mauritius and Bourbon, those specks in the great Indian ocean which, when first discovered, harboured so many curious birds, also furnished one of the earliest known species of Fruit Bats, the Roussette (*Pteropus vulgaris*, see next page), which was described by Gesner and Clusius. This species, which is said to occur also in Madagascar, and even on the mainland of Africa, is about eight and a half inches long, and three feet in expanse of wing. The muzzle, forehead, and cheeks are rusty red; the crown of the head, the nape, and the sides and front of the neck yellowish-red; and two longitudinal bands of the same colour run parallel to each other down the middle of the back, separated by a strip of blackish chestnut, which, with the similarly coloured shoulders, forms a sort of cross; the sides of the back are rusty red, and the lower surface of the body black. It is probably to the generally reddish tinge of its fur that this species owes its French name of Roussette, which has been extended in its application to the whole of the Frugivorous Bats.

THE EGYPTIAN FRUIT BAT.†

The majority of the African Fruit Bats belong to genera which have been separated from the old genus *Pteropus*. Thus we have several species of *Cynonycteris* (*Xantharpyia* and *Eleutherura* of the late Dr. Gray), in which the characters are generally those of *Pteropus*, but there is a short tail more or less enclosed in the interfemoral membrane, and the basal portion of the thumb is joined to the index finger by a membrane. To this genus belongs the Egyptian species already referred to (*Cynonycteris ægyptiaca*), representations of which occur on Egyptian monuments (see page 269). This species is about five and a half inches long, with an expanse of wing of eighteen or twenty inches; the tail is rather more than half an inch long, and the basal half of it is enclosed in the interfemoral membrane; the ears are rather long, rounded at the tips, and naked; the upper surface of the body is pale greyish-brown, becoming yellowish on the sides and the hairy part of the arms, and the lower surface is whitish. These Bats are found abundantly in Egypt, where they dwell amongst the ruins of its ancient edifices, and in the dark chambers of the Pyramids. They also occur in Senagambia in Western Africa, and in Syria.

THE HOTTENTOT FRUIT BAT.

An abundant species of South Africa is the Hottentot Fruit Bat (*Cynonycteris collaris*), specimens of which may be seen in the Zoological Gardens, where they breed pretty freely. This species varies considerably in colour, but usually displays various shades of reddish or greyish-brown. The fur is less dense on the nape of the neck, which in consequence generally has a rather bare appearance. This Bat occurs at the Cape of Good Hope, in Caffraria, and in Mozambique.

THE MARITIME FRUIT BAT.§

These tailed Fruit Bats are represented in the East Indian region by several species, which gives the genus *Cynonycteris* a geographical range from the Philippine Islands in the north-east to the Cape of Good Hope in the south-west. The best-known Indian species (*Cynonycteris amplexicaudata*), is nearly allied to the Egyptian form, but smaller, being little more than four inches in length. Its fur is reddish-brown, or brownish-red above, and so short upon the back that this part appears nearly bare. The range of this Bat extends from the shores of the Persian Gulf to the Philippine Islands, and it appears always to haunt the coasts. As already stated this Bat is supposed by some zoologists to feed on mollusca and other marine animals picked up on the seashore.

* *Pteropus vulgaris.* † *Cynonycteris ægyptiaca.* ‡ *Cynonycteris collaris.* § *Cynonycteris amplexicaudata.*

THE MARGINED FRUIT BAT.*

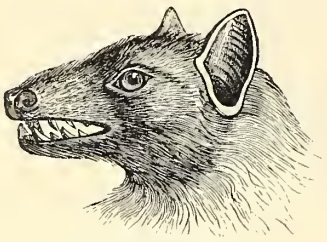
In the *Cynopteri*, which are small Fruit Bats inhabiting Southern Asia and its islands, the characters are very similar to those of the preceding genera, but the muzzle is considerably shorter and more Dog-like, and one of the true molars is deficient, so that the whole series of molar teeth contains four on each side in the upper, and five on each side in the lower jaw. The most abundant

THE ROUSSETTE. (*About one-fifth natural size.*)

species is the *Cynopterus marginatus* (see next page), which is about four inches in length, and varies in colour through different shades of brown and reddish-brown. It is specially distinguished by having the ears surrounded by a white border. This Bat occurs in all parts of India, in Ceylon, in Further India, and in the eastern islands to Celebes and the Philippines. It is exceedingly common, and very destructive to fruits, especially guavas, plaintains, and mangoes. Mr. Dobson gives the following account of the voraeity of a specimen obtained by him at Calcutta :—He gave it "a ripe banana, which, with the skin removed, weighed exactly two ounces. The animal immediately, as if famished with hunger, fell upon the fruit, seized it between the thumbs and the index fingers, and took large mouthfuls out of it, opening the mouth to the fullest extent with extreme voracity. In the space of three hours the whole fruit was consumed. Next morning the Bat was killed, and found to weigh one ounce, half the weight of the food eaten in three hours! Indeed, the animal when eating seemed to be a kind of living mill, the food passing from it almost as fast as devoured, eating being performed

* *Cynopterus marginatus.*

alone for the sake of the pleasure of eating." It is hardly fair, perhaps, to apply the character of this disgusting little gormandiser to his whole species, but no doubt if the rest of his kind only approximate to his prowess, they must do incalculable mischief in the plantations of fruit-trees. According to Captain Hutton, these Bats travel long distances, as much as thirty or forty miles in search of food, and back again the same night. This is most strikingly shown in their frequenting the valleys of the Dehra Doon and Nepaul to feed on the guavas growing there, as they are never seen in these localities during the day, but arrive there during the fruit season about midnight, and depart again before morning. "To reach Dehra," says Captain Hutton, "they must either cross the Sivalik range of hills, from 3,000 to 3,500 feet high, or thread their way for miles through the passes leading into the Doon, though even then we may ask with amazement how, when they are approaching the Sivaliks, they can tell that there is fruit some twenty miles in advance of them! To reach the valley of Nepaul at 6,000 feet of elevation they must ascend and descend the mountains; and yet, wonderful to say, they penetrate no farther into the hills, neither do they descend from the Doon to Mussooree, apparently instinctively knowing that they will find no guavas farther in the hills! Almost equally astonishing is it that, having thus feasted in the Doon and Nepaul, they should be able to find their way back again, through forests and hills, for thirty or forty miles to their natural haunts in the plains." Captain Hutton fully confirms Mr. Dobson's statements as to the greediness of this Bat. He says that one he had "in Calcutta in 1849 appeared to be almost incessantly eating, resting only, even during the day, for a short interval of sleep, and then recommencing upon ripe guavas, as if it had not seen food for a fortnight."



HEAD OF THE MARGINED FRUIT BAT. (*Three-quarters natural size*).

WHITE'S FRUIT BAT.*

A series of peculiar species are inhabitants of the continent of Africa, from the Northern tropic to the Cape of Good Hope. They have the muzzle rather elongated, the molar teeth three on each side in the upper, and five on each side in the lower jaw, the base of the thumb united to the index finger by membrane, and the tail very short and chiefly enclosed in the small interfemoral membrane. The males have tufts of divergent white hairs on the shoulders, whence the generic name of *Epomophorus*, applied to these Bats, has been derived. The best-known species is the *Epomophorus Whitii*, an inhabitant of Western Africa (Senegambia and Guinea), which measures about six and a half inches in length, and has an expanse of wing of about eighteen inches. Its fur is reddish-brown above, and greyish beneath, and both sexes present white spots at the base of the ears.

THE HAMMER-HEADED BAT.†

A species presenting so grotesque an appearance that it might almost have served as the original of one of Callot's demons (see next page), was discovered some years ago in Western Africa, by M. Du Chaillu, and described by Dr. Allen, of Philadelphia. It is allied to *Epomophorus*, but differs from all other Pteropine Bats in the extraordinary size and shape of the head, which has a hammer-like appearance, owing to the muzzle being enormously developed and cut off abruptly in front, and the whole of this part of the animal is garnished with curious fleshy lobes, which give it a most singular aspect. The length of the head and body is about twelve inches, and the expanse of the wings twenty-eight inches. Of its habits nothing appears to be known.

THE HARPY BAT.‡

The Harpy Bat (*Harpyia cephalotes*), is a remarkable species, having a short and rounded head, with the nostrils wide apart and somewhat tubular, and a very peculiar dentition, there being

* *Epomophorus Whitii.* † *Hypsignathus monstrosus.* ‡ *Harpyia cephalotes.*

only two incisor teeth in the upper jaw, and none in the lower, while the upper jaw has only four and the lower one six molars. This Bat, the Molucca Bat of Pennant and Shaw, inhabits the islands of Celebes and Amboyna. It is nearly four inches in length, and has an expanse of wing of about fourteen inches.

Mr. Dobson has quite recently described a second species of Harpy from Duke of York Island, near New Guinea, which may be called the Greater Harpy Bat (*Harpyia major*). It is much

THE HAMMER-HEADED BAT. (*Three-fourths natural size.*)
From the *Proceedings of the Zoological Society*, 1870.

larger than the above species, and is especially remarkable for the great length of the nasal tubes. The general colour of the fur is pale buff.

THE CLOAKED FRUIT BAT.*

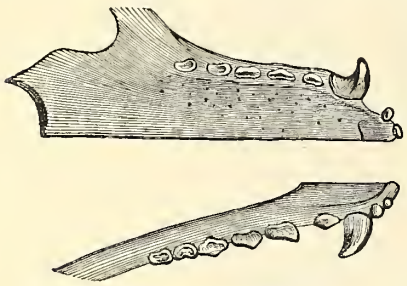
This is another very curious Bat which inhabits Amboyna, but is also met with in Timor and Banda. It differs from all the preceding forms by wanting the claw at the extremity of the first finger, and is further remarkable by having the wing-membranes springing from the middle line of the back, so as to form a complete mantle for the animal. In the form of the head, this Bat resembles the true *Pteropi*, but the dentition approaches that of *Harpyia*, the incisors being usually two in each jaw, and the lower ones sometimes deficient, and the molars four and six in the upper and lower jaws

* *Cephalotes Peronii.*

respectively. This Bat is about six inches long, with an expanse of wing of rather more than two feet. The colour of the fur in adult animals is generally olive-grey, often with a brownish tinge, and the wing-membranes are light brown and translucent. The tail is short, and about half enclosed in the interfemoral membrane.

THE DWARF LONG-TONGUED FRUIT BAT.*

The remaining forms of the Frugivorous Bats to which we have to refer constitute a peculiar group, characterised by having the tongue very long, thin, capable of being pushed far out of the mouth, and covered with peculiar recurved, brush-like papillæ, and the molar teeth very small and scarcely raised above the surface of the gum (see figure below). From the great length of the tongue, the name of *Macroglossus* was applied by F. Cuvier to the first species of this group that was discovered; and, as it is the smallest species of the family, it received from its original describer the specific name of *minimus*. The *Macroglossus minimus* is, in fact, a mere dwarf in comparison with the large Bats which constitute the majority of the Pteropidæ, measuring only from two and a half to three inches in length, with an expanse of wing of from eight to ten inches. The muzzle is long and narrow, with the nostrils not projecting; the index finger has a claw at its tip; the wing-membranes spring from the sides of the body, and run down to the base of the fourth toe; and the tail is very short, free from the interfemoral membrane, but usually concealed beneath the fur. The colour of the fur is reddish-brown. The tongue is said to be two inches long. This little Fruit Bat occurs upon the Himalayas, at Darjéling, and extends thence through Burmah and Siam to the islands of the Eastern Archipelago, and as far south as the northern and western parts of Australia. According to Dr. Horsfield, this species, although far less abundant in Java than the great Kalong, exists there in sufficient numbers to inflict serious injury upon the plantations of fruit-trees. It particularly affects the most succulent fruits, such as those of various species of *Eugenia*, known in Java as Jamboo. Probably the peculiar structure of the tongue has some connection with this soft, juicy diet.



TEETH OF THE DWARF LONG-TONGUED FRUIT BAT.

THE BLACK-CHEEKED FRUIT BAT.†

Among the Bats from Duke of York Island, north-east of New Guinea, lately described by Mr. Dobson, there is a most characteristic species of the long-tongued group, which may be called the Black-cheeked Fruit Bat. It has the long thin tongue, armed with brush-like papillæ, of *Macroglossus*, the nostrils bounded at the sides by naked raised edges, the metacarpal bone of the middle finger as long as the whole index finger, the wing-membranes starting from the sides of the body and from the back of the middle toe. In the number of the teeth it agrees with *Macroglossus*, but differs somewhat in the position of the pre-molars, the first of which are very small and placed close to the canines, while the second and third are separated from this and from each other by considerable interspaces. We have no information as to the habits of this Bat, which is figured on the next page.

THE FIJIAN LONG-TONGUED FRUIT BAT.‡

The only other species of this group was described by the late Dr. Gray, under the name of *Notopteris Macdonaldii*, and it is interesting as reproducing the peculiar character presented by *Cephalotes* of having the wing-membranes springing from the middle of the back. In the structure of the tongue it agrees with *Macroglossus;* but it has no claw on the first finger; its tail is elongated; and it has only two incisors in each jaw, and four molars on each side in the upper, and five in the lower jaw. This curious Bat is an inhabitant of the Fiji Islands.

* *Macroglossus minimus.* † *Melonycteris melanops.* ‡ *Notopteris Macdonaldii.*

THE BLACK-CHEEKED FRUIT BAT. (*Two-thirds Natural Size.*)
From the *Proceedings of the Zoological Society*, 1877.

SUB-ORDER II.—MICROCHIROPTERA, OR INSECTIVOROUS BATS.

CHAPTER III.

HORSESHOE BATS AND MEGADERMS.

INSECTIVOROUS BATS—Mr. Dobson's Objection to the Name—Characteristics—Nasal Appendages—THE VESPERTILIONINE AND EMBALLONURINE ALLIANCES—The Fur in the Two Alliances—THE HORSESHOE BATS—General Characteristics—Distribution—Diet—Carnivorous Propensities—GREATER HORSESHOE BAT—General Appearance—"Nose Leaves"—Habitat—THE LESSER HORSESHOE BAT—Habitat—THE MOURNING HORSESHOE BAT—THE AUSTRALIAN HORSESHOE BAT—THE ORANGE BAT—PHYLLORHINÆ—THE DIADEM BAT—Character of their "Nose Leaves"—Captain Hutton's Account of their Habits—THE PERSIAN TRIDENT BAT—THE MEGADERMS—THE LYRE BAT—Characteristics—Called Vampire by Europeans in India—Mr. Blyth's Account of a Megaderm's Blood-thirstiness—The CORDATE LEAF BAT—THE AFRICAN MEGADERM—THE DESERT BAT.

THE second sub-order of Bats—which includes a much larger number of species, displaying a far greater variety of characters than those which have hitherto occupied our attention—has received the name of *Insectivora*, from the general nature of the diet of the animals composing it. Mr. Dobson objects to this name, chiefly on account of there being already an *order* of Mammalia bearing the same designation; and he proposes to call these Bats *Microchiroptera*, in allusion to the small size of most of the species in comparison with the majority of the Pteropidæ. Moreover, although the food of most of these Bats consists exclusively of insects, some of them feed, at least partially, upon other vertebrate animals, and a few are known to eat fruit.

The Bats belonging to this second sub-order may be at once distinguished by the structure of their molar teeth, which are armed with acute tubercles, separated, more or less completely, by transverse furrows. The ears also differ from those of the Pteropidæ, in that the two margins of the conch start from different points on the surface of the head, and, in a great number of cases, they are complicated by a membranous lobe, springing from near their base, or by a great development of the tragus, or anterior lobe of the ear. The tail in these Bats is generally well developed, and the index finger is never terminated by a claw.

A considerable number of Insectivorous Bats of different families have their noses furnished (we

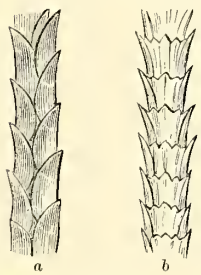
cannot say adorned) with curious leaf-like appendages, often of most complicated construction (see some of the illustrations), and these organs, as has already been stated, probably assist materially in the exercise of that delicate sense of touch which supplements or takes the place of the power of vision in guiding the Bats in their obscure abodes. In general, the presence or absence of nasal appendages being an exceedingly obvious character, has been adopted by zoologists as the means of classifying these Bats, and the order has been commonly divided into two groups—the Istiophora, or those with a nose-leaf, and the Gymnorhina, or Anistiophora, in which there is no such appendage. Mr. Dobson, who has devoted a great deal of attention to the Chiroptera, finds, however, that by following this system certain forms are grouped together which have little in common, whilst in other cases real affinities are lost sight of, and he suggests another mode of division, which, for many reasons, appears to be the most natural that has hitherto been proposed. He ranges the families of his Microchiroptera in two alliances, the leading characters of which may be briefly indicated as follows:—

In the first, or *Vespertilionine alliance*, so called from its including our common Bats (*Vespertiliones*), the tail is generally long, never absent, and always entirely enclosed in the interfemoral membrane, with the exception of the extreme tip, which projects a very little; the pre-maxillary bones are rudimentary, and the upper incisor teeth which they carry small and weak; and the first phalanx of the middle finger is extended in repose in a line with the metacarpal bone.

In the second, or *Emballonurine alliance*, so called from one of the genera included in it, the tail, which is frequently absent or short, except in two or three species, is not contained within the interfemoral membrane, but has its extremity free, usually perforating the membrane and appearing on its upper surface. The pre-maxillary bones are generally well developed, and the incisors large; and the first phalanx of the middle finger is folded forward in repose above or below the metacarpal bone.

The character derived from the condition of the middle finger in repose seems to be regarded as of the most importance by Mr. Dobson, who says that it is connected with differences in the habits of the animals; but those of the tail and incisor teeth will be most useful to the student in determining to which alliance he is to refer his specimens; and, although they are liable to exceptions in the second group, will never *both* fail in the same individual.

A striking confirmation of the naturalness of this arrangement is to be found in the fact that even the microscopic character of the fur differs in the two alliances. In the first, the longer hairs of the fur when magnified show a series of scales, imbricated or partly overlapping each other, something like the grains of corn in the ear, the tips, which are not acute or very prominent, forming a sort of spiral line round the surface of the hair (see Fig. *a*). In the second alliance, on the contrary, the scales—which are smaller and narrowed, with acute and projecting tips—are arranged in rings round the hair, giving it a somewhat jointed appearance (see Fig. *b*). Mr. Dobson has examined the fur of a majority of the genera of these Bats, and also submitted his specimens to the examination of Dr. J. D. Macdonald, F.R.S., and both these gentlemen find the differences in the structure of the hair always perfectly in accordance with the arrangement above indicated, with but two exceptions, one of them being a genus which really forms a sort of connecting link between the two alliances, and the other having fur quite different from that of any other Bat, and in which the scales can hardly be distinguished.



a *b*

HAIRS OF BATS, MAGNIFIED.

(From *Dobson's "Monograph of Asiatic Bats."*)

VESPERTILIONINE ALLIANCE.

FAMILY II.—RHINOLOPHIDÆ, OR HORSESHOE BATS.

The Bats of this family are usually called Horseshoe Bats, from the circumstance that their noses are furnished with leaf-like membranous appendages of rather complicated structure, the front part of which is usually something like a horseshoe in its form (see figure on next page). The nostrils are situated within this horseshoe, between it and the other parts of the nose-leaf, which vary considerably in their shape and structure. The middle finger has two phalanges, or joints, beyond the long metacarpal bone,

a character common to all the Bats of this alliance, with only a single exception; and *the ears have no tragus*. Throughout the family there are two small incisor teeth in the upper jaw, and four in the lower, and three true molars on each side in both jaws; but the number of pre-molars varies, being usually two on each side in the upper jaw, and either two or three in the lower; whilst in one curious species the upper pre-molars are only one on each side.

The *Rhinolophidæ* are confined to the Eastern hemisphere, of which they chiefly inhabit the warmer parts. They are generally insectivorous in their habits, but some of the larger species are said to prey upon other vertebrate animals, and not even to spare their smaller brethren. Thus, Mr. Frith informed Mr. Blyth that "a number of these Bats were in the habit of resorting to the verandah of his residence in Mymensing (Burmah), and that every morning the ground under them was strewed with the hind-quarters of Frogs and the wings of large Grasshoppers and Crickets. On one occasion the remains of a small fish were observed; but Frogs appeared to constitute their chief diet—never Toads, and of a quiet evening these animals could be distinctly heard crushing the heads and smaller bones of their victims."

HEAD OF THE GREATER HORSESHOE BAT.

Captain Hutton also states that various species of *Rhinolophidæ*, and some *Vespertilionidæ*,* when confined with some smaller species than themselves, will prey upon them; and he suggests that these carnivorous propensities may be "the reason why the larger species keep aloof in pairs, instead of congregating, as do some of the smaller kinds." In illustration of this suggestion he gives the following interesting account of a cave frequented by Bats:—He says, "I know of an enormous cave at Mussooree, to which various species, both large and small, are in the habit of resorting for rest and concealment during the day. Standing within this spacious vault in the earliest hours, just before the first streaks of day appear, the spectator is perfectly astonished at the numbers of Bats resorting to it; not, however, in one promiscuous crowd, but in separate detachments, each seeking its own particular quarter of the cavern, and alighting against the sides, at first within reach of a Butterfly-net, and commence crawling upwards and backwards to spots beyond the reach of invasion from below. Here, in one spot, will be seen a pair of *Rhinolophus luctus*, hanging high up, and quite apart from all the rest; in another place hangs a pair of *Phyllorhina armiger*, the large ears and the facial crests in active tremulous motion as the head is turned in every direction to ascertain that no intruder is nigh its dwelling-place, until, this restlessness gradually passing off, the animal hangs at length quietly suspended by the feet. In another direction are a dozen or more of *Rhinolophus minor*, rapidly scrambling all together, like a lot of crabs, up the inequalities of the rocky surface, and hurriedly disappearing into some deep, narrow crack or crevice; while again, in another part, the same scene is observed, as dozens of a very small species of *Nyctiecjus* (*Scotophilus*) scramble into similar hiding-places, to rest in peace until the hour for again emerging in search of prey calls them all forth once more."

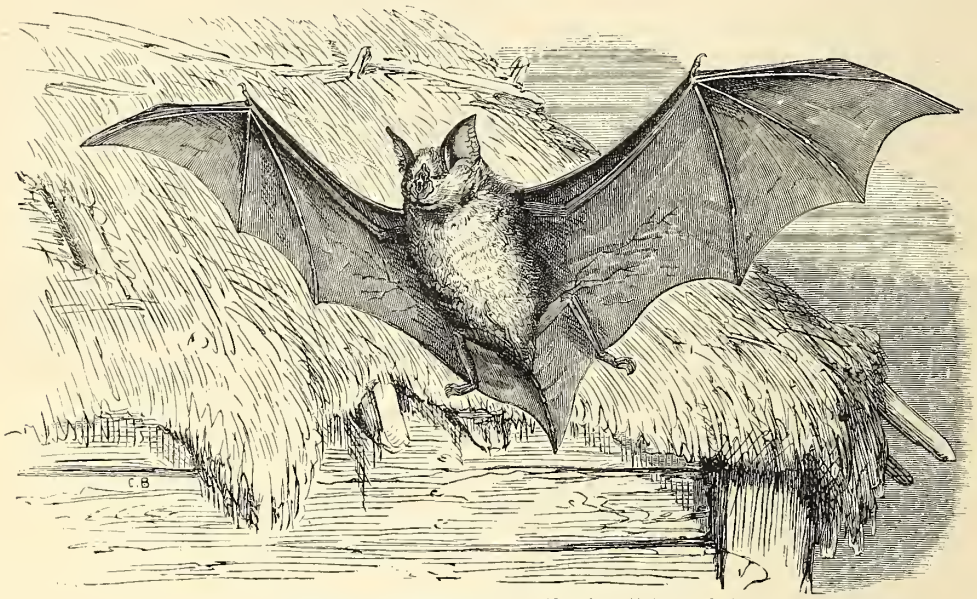
THE GREATER HORSESHOE BAT.†

Although, as already stated, most of the Horseshoe Bats inhabit warm countries, several species are found in more temperate regions. One of these is the Greater Horseshoe Bat (*Rhinolophus ferrum-*

* *Rhinolophus luctus*, *Phyllorhina armiger*, *Nycticejus luteus* (=*Scotophilus Temminckii*), *Miniopterus blepotis*, and *Vespertilio Blythii*.

† *Rhinolophus ferrum-equinum*.

equinum, which occurs, although not very abundantly, in various parts of the South of England. He is a puffy and rather pursy-looking little fellow, with a head which appears full large for his body. The length of his head and body is about two and a half inches, and that of his tail, which is entirely enclosed in the interfemoral membrane, about an inch and one-third. His wings have an expanse of thirteen or fourteen inches. The fur on the upper surface is reddish-grey, and on the lower surface very pale grey; the membranes are of a dingy brown colour, and the ears and nasal appendages pale brown. The ears are large, broad at their attachment to the head, pointed and turned outwards at the apex. From the outer margin ten or a dozen transverse furrows run towards the middle of the ear. The outer margin, at its junction with the head, is also continuous with a low rounded lobe* which bounds the aperture of the ear in front, and may be used to close the cavity. The nasal appendages, or "nose-leaves," are very curious and complicated (see figure, p. 281).



THE GREATER HORSESHOE BAT. (*One-third Natural Size.*)

The anterior, or horseshoe-shaped portion, lies longitudinally upon the nose, and is formed of three concentric elevations, the innermost of which bounds the depression in which the nostrils are placed. Between the nostrils arises the central process, the anterior portion of which forms a sort of cup, behind which the process is slightly narrowed and excavated, but again widens before terminating in a short but rather sharp point. This point overhangs the third, or frontal leaf, which touches the horseshoe portion, and is about as broad as the latter at their junction, and tapers up to a point upon the forehead. The eyes, which are like little black beads, are placed on each side of the junction of the horseshoe and the frontal leaf.

These curious structures are found with slight variations in all the species of the genus *Rhinolophus*, to which this Bat belongs. The nasal appendages vary somewhat in the form and proportions of their parts, and the basal lobe, or antitragus of the ears, is developed in different degrees in various species, but their general character is always recognisable. Other marks by which the species of this genus may be recognised are the presence of three joints in the first toe, the others possessing only two, and the dentition, which includes the full number of teeth developed in the family, namely, incisors, $\frac{2}{4}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{2-2}{3-3}$, molars, $\frac{3-3}{3-3}$.

The Greater Horseshoe Bat lives chiefly in deserted quarries, old buildings, and natural caverns,

* To this lobe the name of "antitragus" has been given.

and is said to frequent the darkest and most inaccessible parts of such excavations. Thus, Montagu found it in company with the smaller species next to be described, in "Kent's Hole," near Torquay, "a retreat," says Mr. Bell, "so dark and gloomy, that no other species, even of this lucifugal family, were found to frequent it." In such retreats it passes the winter in a torpid state, coming forth in the spring to prey upon the insects which constitute its sole nourishment. It is said often to feed upon chafers, but to eat only the body. That it does not disdain smaller game, however, appears from Pennant's record of its original discovery in England by Dr. Latham, who obtained it at Dartford, in Kent, where, says Pennant, "they are found in greatest numbers in the saltpetre houses belonging to the powder-mills; and frequent them during the evening for the sake of the Gnats which swarm there. They have also been found during winter, in a torpid state, clinging to the roof." Mr. James Salter, in a communication to Mr. Bell, mentions his having caught one of these Bats on the 29th of September, 1865, in so appropriate a locality as the "haunted room" at Tomson Manor House, Dorsetshire. It was flitting about the room when he went to bed, having entered by an open window. "On the next three nights, which were still and calm," he says, "I saw numbers of (apparently) the same Bats flying around the house among a grove of sycamores. The flight was low, short, and sluggish, both in the room and out of doors."

This Bat suckles its young, after the usual fashion of Bats, at the two pectoral teats. Several authors, and among others Geoffroy, have maintained that the Horseshoe Bat, and indeed all the species of the family to which it belongs, possess, besides the ordinary pectoral teats, a second pair situated on the groin. This, however, is not the case, for the nipple-like appendages situated on the groin in the females of this group have been proved to have no connection with any mammary glands.

In England the Greater Horseshoe Bat has been found in various localities in the southern counties. Besides Dartford, where it was originally discovered in this country, Mr. Bell mentions Margate, Rochester, and Bristol Cathedrals, Colchester, caverns at Clifton, and the Undercliff of the Isle of Wight. On the continent of Europe it inhabits the whole of the southern and central parts from Spain and Portugal in the west, to Greece and Turkey in the east, extending northwards as far as central Germany and southern Russia. In Asia it is found in Syria and Asia Minor, and ranges thence eastwards to Nepaul and Mussooree; whilst in Africa it appears to stretch from Algeria to the Cape of Good Hope. Over this wide range, as might be expected, the species does not always display precisely the same characters, and variations of greater or less importance have led to the establishment of supposed distinct species; amongst others, the Japanese *Rhinolophus nippon* is regarded by Mr. Dobson as identical with our Greater Horseshoe Bat.

THE LESSER HORSESHOE BAT.*

The Lesser Horseshoe Bat, the second British species of this genus, was formerly regarded only as a small variety of the preceding, and was first distinguished by Colonel Montagu, who also first detected its occurrence in this country. It is about half an inch shorter than the Greater Horseshoe Bat, and its expanse of wing is about nine inches. In general aspect it resembles the larger species. The fur is equally soft and full, and of the same colours, except that the upper surface is a little browner, and the lower parts rather more tinged with yellow. In the ears the transverse furrows are scarcely perceptible, and the basal lobe is rather larger in proportion. There are also some small, but constant, peculiarities in the structure of the nasal appendages. The central leaf is less prominent and less cupped at the base than in *R. ferrum-equinum;* the frontal leaf is lance-shaped, and not much dilated at the sides towards the base; and the outer margin of the horseshoe is slightly crenulated (see figure).

HEAD OF LESSER HORSESHOE BAT.

In its habits this kind seems to agree with the Greater Horseshoe Bat. As already men-

* *Rhinolophus hipposideros.*

tioned, the two species were taken together by Montagu in "Kent's Hole," clinging in considerable numbers to the vaulted roof of the interior apartments. It was first discovered by him in rather a singular situation, namely, a hole over a baker's oven, which it had entered through a fissure. He afterwards found it in a dark shed surrounded by tall trees, at Lackham, in Wiltshire. In the second edition of Mr. Bell's "British Quadrupeds" there is an interesting account of the manners of this species. The writer mentions the occurrence of the Lesser Horseshoe Bat in two localities in Warwickshire, one of these being the roof of the neglected mansion of the Marquis of Hertford at Ragley, near Alcester. Numbers of Long-eared Bats were found, chiefly in pairs, in holes in the massive timbers, but "although several of the Horseshoe Bats were seen flitting in the deep gloom, broken only by an occasional gleam of light through some small crevice, and by our lighted candle, yet a careful search was for some time unrewarded by the discovery of a single individual in its resting-place. A great accumulation of excrement around a huge central stack of chimneys at length attracted attention, and a long stick, thrust upwards in a narrow opening between the chimneys, soon dislodged several of these Bats, which were caught as they descended, and before they were well on the wing, after which pursuit proved useless. Some of these examples being at various times liberated in a room, exhibited extraordinary powers of flight. One of them displayed in its search for a means of exit an ability which was quite extraordinary. It literally flew into every part of the room, and behind and under everything, even under a bookcase standing against a wall, although there was scarcely a space of three inches between it and the floor . . . . it flew into a vacancy occasioned by the removal of a moderate octavo volume, without having so much as touched anything with the tips of its wings." In examining the window this Bat searched every pane inch by inch, its wings while thus occupied being "kept in a vibratory state, the face of the animal being directly in front of the glass, and very near to it, as if looking out of window." The impression produced on the observers was that the animal was "feeling its way about like a blind person;" but "at the same time its shyness when approached sufficiently testified that its organs of sight were by no means inactive." In order to rest, instead of adhering like most other Bats against some object by means of its claws, it always sought for something from which it could hang freely. According to Dr. Leach this Bat is easily tamed, but is fond of concealing itself.

Besides the English localities already mentioned, the Lesser Horseshoe Bat is found not unfrequently at Cirencester and in some parts of Ireland. Professor King has obtained it in Galway; and from the statements of Mr. Foot and Professor Kinahan it appears to be the commonest Bat in some parts of County Clare. Its European distribution is much the same as that of the preceding species, but it seems to extend rather farther to the north. It is also found in the Caucasus and in South-western Siberia. North African specimens are said to be paler in colour than European.*

HEAD OF THE MOURNING HORSESHOE BAT.

THE MOURNING HORSESHOE BAT.†

Other species of *Rhinolophus* are met with chiefly in India and the Asiatic Islands. One of the most striking of them, and indeed the largest species of the genus, measuring more than three and a half inches in length, is the Mourning Horseshoe Bat (*Rhinolophus luctus*, see figure), an inhabitant of the higher grounds of India, Ceylon, Java, Sumatra, and the Philippine Islands. This Bat is remarkable for the great development of the nasal appendages, the central leaf being expanded on each side into a lobe nearly as long as the central ascending portion, the horseshoe very large, so as to project beyond the upper lip, and the frontal leaf so long as to ascend between the ears. The latter organs are also of

* Besides the two species found in Britain, two others inhabit southern Europe, the Levant, and Northern Africa, namely, *Rhinolophus euryale* and *R. Blasii*, the latter often described under the name of *R. clivosus*. Both these species are nearly allied to our Horseshoe Bats.

† *Rhinolophus luctus.*

great size, and have a large basal lobe (antitragus) separated from the outer margin of the ear by a deep angular notch. The fur is very long and thick, and usually black with grey tips, so that the species appears to be in mourning, whence its specific name; it is, however, subject to considerable variation in this respect, some specimens being reddish-brown. Captain Hutton, who resided for a considerable time at Mussooree, has described the habits of this Bat, which he found in the Himalayas up to an elevation of 5,500 feet, where it was "hanging from the roof of an outhouse, looking, with its ample black wings folded round it as a cloak, somewhat like a large black cocoon." He says that it commences its flight rather early in the evening, and generally keeps at about twenty or thirty feet from the ground, wheeling, with a somewhat heavy and noiseless flight, around buildings and large trees in search of small Moths and other insects. He adds that he has taken them from the roofs of outhouses and from wide caves in limestone rocks, and that they seem generally to live in pairs and not in communities, although several pairs may be found in a large cave. At Mussooree they fly only during the

THE ORANGE BAT. *(One-half Natural Size.)*

warmer months, and remain in a semi-torpid state during the winter, but Captain Hutton suggests that in the warmer climates of Sikkim and the Khasia hills they may be active all the year round. Another smaller species with a similar central nose-leaf has been described under the name of *R. trifoliatus;* it is an inhabitant of the eastern coast of India, Java, and Borneo. These two species form the genus *Aquias* of the late Dr. Gray.*

THE AUSTRALIAN HORSESHOE BAT.†

A single species of *Rhinolophus* occurs in Australia, having been obtained from caverns on the Murrumbidgee River, and also near Richmond River in New South Wales. It has pale mouse-coloured fur. The ears are large, with long basal lobes, and the nasal appendages are larger than in the European species, the frontal leaf being lance-shaped and long, and the horseshoe rather deeply

* The commonest of the numerous Eastern species of the genus are Pearson's Horseshoe Bat (*R. Pearsonii*), which has a very large nose-leaf and greatly developed ear lobes, and is found throughout the lofty hill-countries from the Himalayas to the mountains of Burmah and China; Roux's Horseshoe Bat (*R. affinis*), which varies in colour from orange-brown to greyish-brown, and is found among the hills all over India, and in Ceylon, Burmah, Java, Sumatra, and Borneo; and the Dwarf Horseshoe Bat (*R. minor*), only about one inch and three-quarters in length, which occurs in Burmah, Yunan, Java, Sumatra, Borneo, and Japan. Several varieties of the last two species have been described as distinct forms.

† *Rhinolophus megaphyllus.*

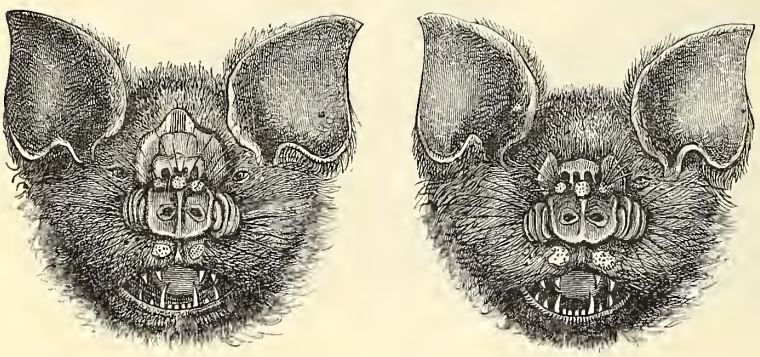
notched in front. In allusion to the large size of the nose-leaves this species has been called *R. megaphyllus*.

THE ORANGE BAT.*

Another Australian species of Leaf-nosed Bat, belonging, however, to a distinct genus, of which, indeed, it is the sole representative, is the Orange Bat (*Rhinonycteris aurantia*, see p. 285). This species, which is about two inches long, is clothed with a soft fur, which, in the male, is of a bright orange colour, and in the female pale yellow. This coloration is exceedingly remarkable in an animal of nocturnal habits, as these are generally rather sombre in their tints. The nose-leaf in the Orange Bat is somewhat similar in its character to that of the true *Rhinolophi*, but in its other peculiarities this Bat is rather related to those which we shall next have to describe, and thus forms a sort of transition between the two groups. It has the toes equal, and composed of only two phalanges, a character which distinguishes it from the preceding species; whilst its resemblance to them in the structure of the nose-leaf serves to separate it from its following allies. The teeth resemble those of *Rhinolophus*. In repose the tail and interfemoral membrane are generally turned back, which appears to be the case in some at all events of the following species. This species inhabits Northern Australia, and is especially abundant on the Coburg peninsula. It reposes during the day in hollow spouts and holes of the gum-trees.

THE DIADEM BAT.†

Whilst the *Rhinolophi* are chiefly inhabitants of elevated localities, especially in tropical regions, the members of the second large genus of Horseshoe Bats (*Phyllorhina*) for the most part frequent the plains and lower hills of the same countries. The most definite character separating the *Phyllorhinæ* from the *Rhinolophi* is the presence of only two phalanges (joints) in all the toes of the hind feet, the first toe in *Rhinolophus* having three such joints. The nose-leaf consists of a horseshoe and of two other portions, which, however, differ considerably in form from those of *Rhinolophus*, the anterior portion being horseshoe shaped, but not notched in front, the intermediate part not forming a prominent process, but broad and heart-shaped, and the posterior part broad, erect, and concave in front. The number of teeth is the same as in *Rhinolophus*, except in one species (*P. tridens*), which has only a single pre-molar on each side in the upper jaw. Fourteen species of this genus are cited by Mr. Dobson as inhabiting the East Indies and the islands of the Eastern Archipelago, and one of them, the Diadem Bat (*Phyllorhina armigera*), which is found among the mountains of Northern India, extends its range as far north as Amoy in China. The characters of the nose-leaf in this species will be seen from the annexed figures, which show strikingly the great complexity of this curious apparatus. Behind the nose-leaf is the aperture of a peculiar sac situated in the forehead, which is characteristic of many species of the genus, and which can be turned out like the finger of a glove at the pleasure of the animal, and the surface of which secretes a waxy substance. Its centre bears a tuft of straight hairs, the tips of which project from the orifice when the sac is drawn in. The Diadem Bat is rather a large species, the head and body measuring from three and a half to four inches in length, and the expanse of the wings being about two feet. Its general colour is light brown, darker on the upper surface, where the hairs are ringed with three colours—pale sepia at the base, then grey, then dark sepia, with the extreme tips a little paler.



HEAD OF THE MALE AND FEMALE DIADEM BAT, ENLARGED. (*After Dobson.*)

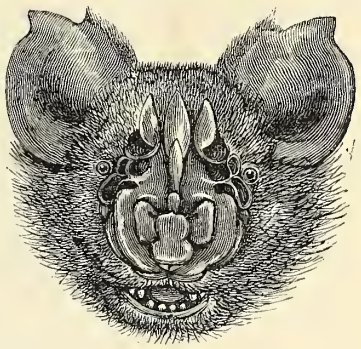
* *Rhinonycteris aurantia.* † *Phyllorhina armigera.*

The late Captain Hutton has given an account of the habits of this species as observed by him at Mussooree, where specimens were captured at elevations of 5,500 and 6,000 feet above the sea-level. At the latter elevation a pair resided in a loft, from which they issued every evening about dusk, and flew with a slow, deliberate flight round the house, from which they never departed to any great distance. They did not remain on the wing long at a time, but retired at intervals to their dwelling-place in the loft. The same writer describes these Bats, which seem to emerge from their concealment very early in the evening, as leisurely wheeling with noiseless flight round some wide-spreading oak, attracted by the loud discordant note of a large *Cicada*, which is abundant during the rainy season, and only pours forth its clamorous evening song just as the sun begins to dip below the horizon. "It is during this dreadfully harsh concert," he adds, "when almost every tree sends forth its stunning notes, that this Bat emerges from its hiding-place, wheeling round and round the trees, scanning each branch as he slowly passes by, now rising to a higher circle, and then descending towards the lower branches, until at length, detecting the unfortunate minstrel, it darts suddenly into the tree, and snatching the still screaming insect from its perch, bears it away."

In captivity, according to Captain Hutton, the large ears of this animal are kept in a constant, rapid, tremulous motion, and the creature emits a low purring sound, which is exchanged for a sharp squeak when it is alarmed or irritated. When it is suspended in a resting attitude the tail and interfemoral membrane are turned up, not in front, as usual in Bats, but behind, upon the lower part of the back. In this species and its allies Captain Hutton further noticed that when they are disturbed "the whole of the facial crests are kept in a state of constant agitation; and as the animal hangs suspended by the feet, the head and muzzle are stretched forth, and turned about in every direction, as if for the purpose of sniffing out the presence of danger, and ascertaining the cause of the disturbance."*

THE PERSIAN TRIDENT BAT.†

Under this name Mr. Dobson describes a very remarkable species of this family in which the nasal appendages seem to attain the extreme of complexity (see figure). The ears also are of very peculiar construction. This is a small species, about two and a quarter inches long, and of a pale buff colour, specimens of which were obtained at Shiraz in Persia at an elevation of about 4,750 feet above the sea. Its nearest ally, curiously enough, is to be found, according to Mr. Dobson, in the Australian Orange Bat (*Rhinonycteris aurantia*).



HEAD OF THE PERSIAN TRIDENT BAT, ENLARGED. (*After Dobson.*)

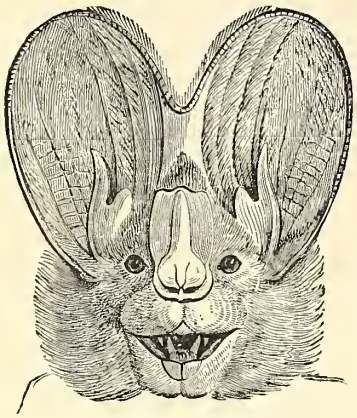
Frith's Short-tailed Bat (*Cœlops Frithii*) is a still more remarkable species, single specimens of which have been obtained from the Sunderbunds and from Java. It is most nearly allied to the *Phyllorhinæ*, but has the horseshoe part of the nose-leaf composed of two notched pieces, the front lobes of which cover the base of two long hanging leaflets, the tail short, the interfemoral membrane deeply excavated, and the index finger unusually long, and composed chiefly of the metacarpal bone.

* Other common Eastern species are the Masked Leaf Bat (*Phyllorhina larvata*), which occurs in Bengal, Further India, Siam, and Java; the Bicolorous Leaf Bat (*P. bicolor*), which inhabits India, China, and many of the Eastern islands; and the Indian Horseshoe Bat (*P. speoris*), an abundant form in Central and Southern India and in Ceylon, and which has also been met with in Burmah. A single species (*P. taitiensis*) has been described from Tahiti. It is very nearly related to the last-named Indian form, if not merely a variety of it. A single species (*P. cervina*) also inhabits North Australia, where it has been met with at Cape York, and in sandstone caverns in Albany Island. It is about two inches long; above, tawny-brown, darker on the face, head, and shoulders; below, paler, with a grey tinge on the belly. Several species of the genus inhabit the warmer parts of Africa, and one of these (*P. tridens*), a small species, only two inches in length, an inhabitant of Egypt and Nubia, has the posterior nose-leaf divided into three teeth towards the forehead, a character which it displays in common with an Indian species (*P. Stoliczkana*), and another from Amboyna and Batchian, of still more diminutive proportions. A distinct genus (*Asellia*) has been proposed for the reception of these Bats. The largest species of the genus comes from Guinea and the Gold Coast, on the west coast of Africa. It is nearly five inches in length, and has received the name of *Phyllorhina gigas*. It is associated with two or three smaller species, and two or three others occur in Southern and Eastern Africa.

† *Triænops persicus.*

FAMILY III.—NYCTERIDÆ.

The development of peculiar nasal appendages for which the *Rhinolophidæ* are remarkable is still more striking in some species of another family, the members of which were formerly included in the preceding. In these Bats (the *Nycteridæ* of Mr. Dobson) the ears are enormously developed, membranous, and united either by a portion of their inner margins, or by a transverse band of membrane, the tragus or earlet is greatly developed, and the middle finger contains two phalanges.*



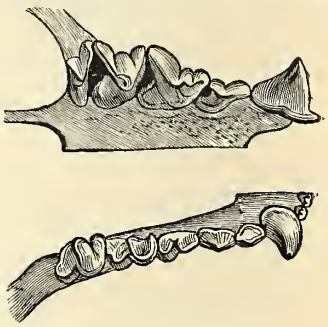
HEAD OF THE LYRE BAT.

The species inhabit the warmer parts of the Old World.

THE LYRE BAT.†

The extraordinary development of the ears and of the membranous appendages of the nose is greatest in the species of this genus, which has in consequence been denominated *Megaderma*, two of which inhabit tropical Asia, whilst two occur only in the warmer parts of Africa.

Of all the species the most abundant and best known is the Lyre Bat (*Megaderma lyra*, see figure), which is found with but little variation in its characters throughout continental India, from Cashmere to Cape Comorin, and also in the adjacent island of Ceylon. This extraordinary little creature, which measures only about three and a half inches in length, and is of a slaty blue colour, paler beneath, has its ears considerably longer than its head, and united for nearly half the length of their inner margins, and the earlets (*tragi*) very long, divided at the end into two parts, one of which, the posterior, is pointed, and a good deal longer than the other, which is rounded off at the end. The ears are, in fact, about half the length of the head and body. The nose-leaf starts from a nearly circular base, lying horizontally upon the muzzle, and rises like a sort of strap more than half an inch long, the front surface of which has a projecting ridge running up its middle, and corresponding to a deep groove on the posterior surface. The nostrils are situated in the concavity of the basal disc from which the nose-leaf springs. In this and the other species of *Megaderma* there are no incisor teeth in the upper jaw (see figure), the intermaxillary bone itself, which ought to bear these teeth, being represented only by a cartilaginous piece, which fills up the space between the canines; and the tail is exceedingly short, and contained in the basal part of the interfemoral membrane, which is large, and has its hinder margin concave, and not pointed as in most Bats.



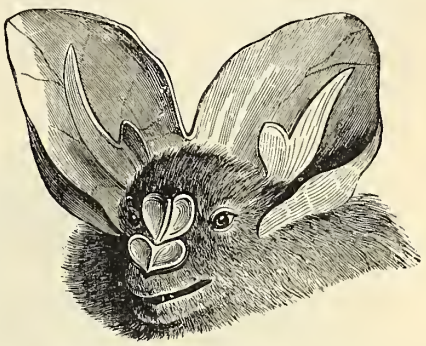
TEETH OF THE LYRE BAT.
(Three times Natural Size.)

The great size of the ears and nasal appendages in these Bats have led Europeans in India to give them the name of Vampires, as they agree in these particulars with the true Vampire Bats of South America, and the name is certainly better applied to them than to the frugivorous Pteropidæ, which are sometimes called Vampires even by zoologists. It is, however, a singular fact that in both these groups the extraordinary developments of membrane about the head should be proved to co-exist with more bloodthirsty habits than are common to the Bats generally. It does not indeed appear to be absolutely made out that *Megaderma lyra* condescends to partake of that insect diet which contents so many of its fellows. As Mr. Dobson remarks, "The very peculiarly-shaped, elongated, narrow muzzle and large trenchant canines, with acutely-pointed basal cusps (see figure) of this and of the other species of *Megaderma*, the projecting mandible and divided lower lip, so different from all Insectivorous Bats, naturally lead us to suspect corresponding

* This character is of special importance here, as serving to distinguish the Megaderms from the species of another family of Leaf-nosed Bats belonging to the second principal group of Microchiroptera.

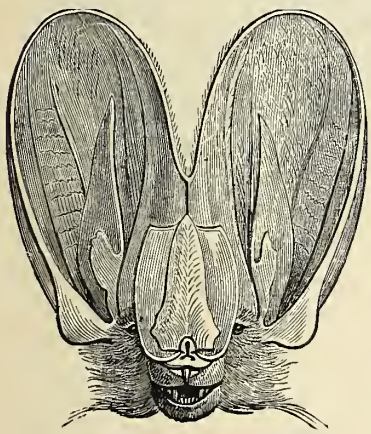
† *Megaderma lyra.*

differences in habits." And he goes on to say that in examining the stomach and intestines of numerous specimens of the present species, he always found them either perfectly empty or filled with a pultaceous matter, in which no remains of insects were to be recognised. Mr. Hodgson, however, found insects in the specimens examined by him. But whether it contemns insects or not, an observation made by the late Mr. Blyth suffices to prove that higher forms of animal life, and indeed its own near relations, are exposed to its attacks. The account given by Mr. Blyth is so interesting that, although rather long, we may give it entire :—



HEAD OF THE CORDATE LEAF BAT.

"Chancing one evening," he says, "to observe a rather large Bat enter an outhouse, from which there was no other egress than by its doorway, I was fortunate in being able to procure a light, and thus to proceed to the capture of the animal. Upon finding itself pursued, it took three or four turns round the apartment, when down dropped what at the moment I supposed to be its young, and which I deposited in my handkerchief. After a somewhat tedious chase, I then secured the object of my pursuit, which proved to be a fine female of *Megaderma lyra*. I then looked to the other Bat which I had picked up, and, to my considerable surprise, found it to be a small *Vespertilio*, nearly allied to the Pipistrelle of Europe, which is exceedingly abundant, not only here, but apparently throughout India. The individual now referred to was feeble from loss of blood, which it was evident the *Megaderma* had been sucking from a large and still bleeding wound under and behind the ear; and the very obviously suctorial form of the mouth of the Vampire was of itself sufficient to hint the strong probability of such being the case. During the very short time that elapsed before I entered the outhouse, it did not appear that the depredator had once alighted; and I am satisfied that it sucked the vital fluid from its victim as it flew, having probably seized it on the wing, and that it was seeking a quiet nook where it might devour the body at its leisure. I kept both animals separate till next morning, when, procuring a convenient cage, I first put in the *Megaderma;* and after observing it for some time, I placed the other Bat with it. No sooner was the latter perceived than the other fastened upon it with the ferocity of a Tiger, again seizing it behind the ear, and made several efforts to fly off with it; but finding it must needs stay within the precincts of its cage, it soon hung by the hind legs to the wires of its prison, and after sucking its victim till no more blood was left, commenced devouring it, and soon left nothing but the head and some portions of the limbs."



HEAD OF THE AFRICAN MEGADERM.

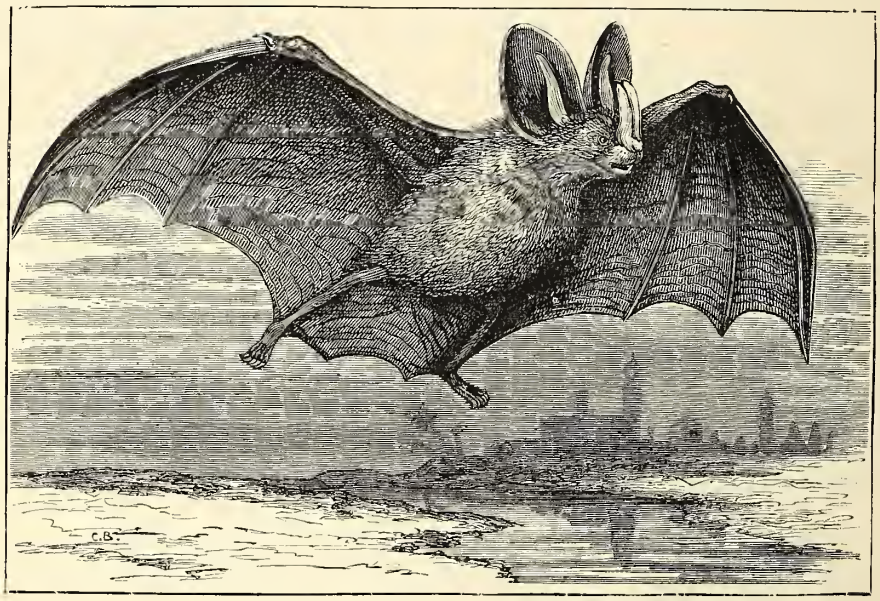
According to Mr. Jerdon, the Lyre Bat frequents old buildings, pagodas, roofs of houses, and caverns, and is very abundant in the innermost chambers of the cave temples of Ellora and Ajunta. The same writer states that it has been known to eat Frogs and fish; indeed, Mr. Blyth also charges it with a particular fondness for Frogs, and says that on quiet evenings the Bats may be distinctly heard crunching the skulls and smaller bones of their amphibious victims.*

The other Oriental species, the Cordate Leaf Bat (*Megaderma spasma*, see figure), very nearly resembles the preceding, both in colour and in general characters, but the posterior division of the earlet is larger and more acutely pointed, the nose-leaf, although similar, is shorter, and has the sides convex, and its concave basal disc is considerably larger. This species is an inhabitant of the whole Malayan region, of Ceylon, Java, Sumatra, Borneo, Celebes, Ternate, and the Philippine Islands.

* See also some general remarks on the supposed carnivorous propensities of the *Rhinolophidæ*, p. 281.

THE AFRICAN MEGADERM.*

The best known African species (*Megaderma frons*) is an inhabitant of the west coast of that continent, where it is found in Senegal and Guinea. In this Bat the ears and nasal appendage (see p. 289) attain even a greater development than in *Megaderma lyra;* the earlet is very long, especially the posterior division of it; the ears are united by their inner margin for about half their length; and the fur is of an ashy colour, with a faint yellowish tinge. A second African *Megaderma* has been recently described by Professor Peters under the name of *M. cor;* it is from Egypt, and somewhat



THE AFRICAN MEGADERM. (*One-third Natural Size.*)

resembles *M. spasma* in the form of its nose-leaf, but in other respects is more nearly related to *M. frons.*

THE DESERT BAT.†

At the first glance, the Desert Bat would seem to have but little to do with the Megaderms, but its general organisation is very similar. The nose-leaf—the striking characteristic of the head in the Megaderms—is entirely wanting, unless indeed we may, with Professor Gervais, regard the groove which runs up the face from the nose to the forehead as really representing a sunken nose-leaf. This groove, or furrow, is a deep depression, increasing both in width and depth as it runs backwards, and is of such extent as to leave traces of its existence even on the underlying bones. In its posterior part the floor of the depression is divided lengthwise by a narrow ridge, and its sides are margined, as far back as the eyes, with peculiar horizontal cutaneous appendages. It is thus, evidently, a somewhat different manifestation of the tendency towards a peculiar development of the cutaneous system in the neighbourhood of the nose which we have seen to be characteristic of the Rhinolophidæ and Megaderms, and no doubt subserves the same purpose in the economy of the animal as the external nasal appendages of those Bats.

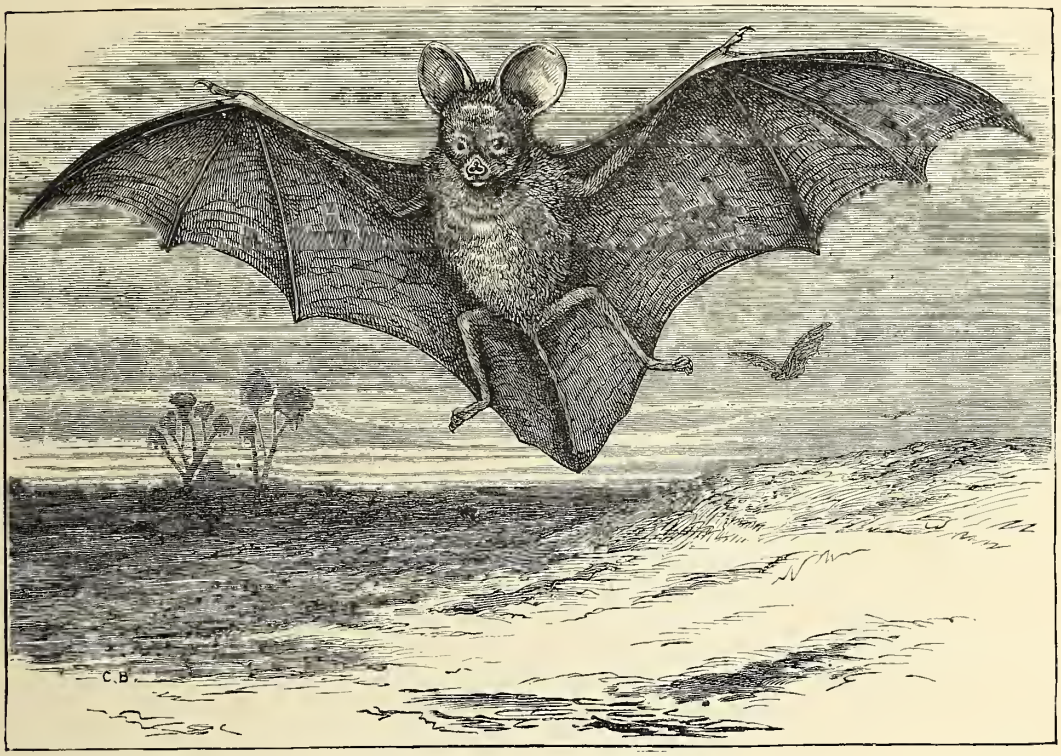
HEAD OF THE DESERT BAT.

The ears are large, and united across the forehead by a sort of membranous band; the tail is

* *Megaderma frons.* † *Nycteris thebaica.*

long, and contained within the interfemoral membrane; and the intermaxillary bones are present, and bear four incisor teeth. In the lower jaw there are six incisors. The canines, as in *Megaderma*, are large and powerful; there is a single pre-molar on each side in the upper, and two in the lower jaw, and the true molars are three on each side in both jaws.

These characters are common to all the species of the genus *Nycteris*, most of which are inhabitants of the continent of Africa. The Desert Bat (*N. thebaica*) is found in the desert regions of Egypt and Abyssinia, and receives its name from its occurrence in the Thebaid, that desert the caves of which gave shelter to so many hermits in early Christian times. It is a small Bat, the length of its head and body being about two and a half inches. Its ears are longer than the head,



THE DESERT BAT. (*One-half Natural Size.*)

and the tail is about as long as the body, and enclosed within an ample interfemoral membrane, which is stretched on each side by a long heel-spur. The fur is of a grey colour.*

These Bats possess an exceedingly curious faculty, namely, the power of inflating the skin with air. The skin adheres to the body only at certain points, where it is connected by a loose areolar tissue, and the spaces thus left can be filled with air at the pleasure of the animal, through the large cheek-pouches, which have an opening at the bottom, and thus communicate with the spaces under the loose skin. When the animal chooses to inflate its skin it fills its lungs with air, and then, closing the mouth and nostrils, and contracting the chest, forces the air through the openings in the cheek-pouches under the skin. Its return is prevented by sphincter muscles, with which the above-mentioned apertures are provided, and also by large valves on the neck and back. By this means the Bat has the power of inflating its skin to such an extent as to resemble, according to Geoffroy, "a balloon with wings, a head, and feet attached to it." Geoffroy compares this condition of things with that of the fish of the genus *Tetraodon*, which also have the power of inflating their skins with air, but adds that

* Other described African species are *N. capensis* (Smith); *N. macrotis* (Dobson); *N. hispida* (Schreber); and *N. grandis* (Peters). The only species found out of Africa is the Javanese Desert Bat (*N. javanica*).

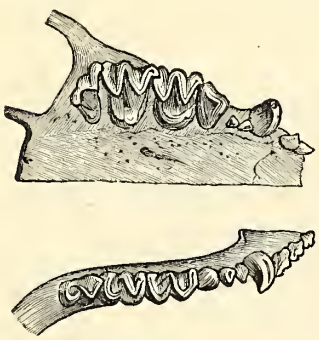
"more fortunate than the *Tetraodon*, which can only return to its original condition by becoming a mere inert mass on the surface of the water, the Bat preserves all its faculties, or, what is better, increases their energy by becoming lighter and capable of more rapidity in flight." This supposed advantage is at least questionable.

CHAPTER IV.

FAMILY IV.—VESPERTILIONIDÆ, OR TRUE BATS.

The Genus *Vespertilio* and the Family Vespertilionidæ—Characteristics: Nostrils—Tail—Ears—Dentition—Diet—Distribution—Long-eared Bat—Ears—Distribution—Asleep—In Captivity—Barbastelle—Characteristics—Distribution—Habits—Flight—In Captivity—Big-eared Bat—Townsend's Bat—The Genus *Nyctophilus*—Its true place—Characteristics—Geoffroy's Nyctophile—Pipistrelle—Distribution—Diet—Noctule—Natural Food—Mr. Daniell's Observations—Serotine—Parti-coloured Bat—Hairy-armed Bat—Negro Bat—Kuhl's Bat—Nilsson's Bat—Coromandel Bat—Thick-footed Bat—Temminck's Bat—Welwitsch's Bat—New Zealand Bat—Mouse-coloured Bat—Natterer's Bat—Daubenton's Bat—Whiskered Bat—Black and Orange Bat—Painted Bat—Harpy Bat—Red Bat—Schreiber's Bat—Brown Pig-Bat—Straw-coloured Bat.

Linnæus, in his "Systema Naturæ," united all the Bats known to him (with the exception of a single species, which, by a curious perversion of judgment he referred to a distinct genus, and placed in quite a different order) under the single genus *Vespertilio*. Later writers, finding it necessary, as their knowledge of these animals increased, to divide the Bats into many genera, have gradually, as it were, cut off portions of the old Linnæan genus and given them new names, always retaining the old name for the group which might be considered to include the most typical forms of the original genus *Vespertilio*, the ordinary Bats of European countries. Of these, only two are noticed in the last edition of the work of the great Swedish naturalist, and even these are now referred to two distinct genera, and the generic name of *Vespertilio* is now retained by only one of the few species with which Linnæus was acquainted. The genus, however, as at present restricted, contains a great number of species, all of which present the characters of what may be called an average Bat, forming, as it were, the centre (or part of the centre) round which the other groups forming the order may be ideally arranged, and hence it very appropriately bears the old name *Vespertilio*, as Bat *par excellence*, constitutes the type of the family Vespertilionidæ, and gives its name to the Vespertilionine alliance. In point of fact the genus *Vespertilio* and the family Vespertilionidæ may be regarded as the ideal centre of the whole order. As in other groups of the same kind the number of species contained in the family is very considerable, and their structural differences are generally minute, these, indeed, being the characteristics usually presented by what are called typical groups, the study of which is on this account attended with peculiar difficulties.



DENTITION OF THE THICK-LEGGED BAT. (*Three times Natural Size.*)

Except in one Australian genus (*Nyctophilus*), which has been removed here from among the Megaderms by MM. Tomes and Dobson, the nostrils in the Vespertilionidæ are simple round or crescentic apertures placed at the extremity of the muzzle, and not surrounded by leaf-like appendages. The tail is always long, contained in the membrane between the legs, which it traverses from base to apex, usually leaving a single joint projecting beyond the membrane; the ears are of moderate or large size, are generally separate, and are furnished with large tragi. With regard to the teeth, the upper incisors are separated in the middle by a wide space and placed close to the canines. The number of incisor teeth in the upper jaw varies, being generally four, standing in pairs in the pre-maxillary bones, but in some species there is only one incisor on each side, and this difference may not be associated with any other characters sufficient to justify the generic separation of the species. The lower incisors are almost always six in number; one genus only has four. The canines are of moderate

length and strength. The pre-molars again are exceedingly variable; there may be three or two on each side in both jaws, or one on each side in the upper and two in the lower jaw, but the occurrence of two above and three below is very rare. As a rule, when there are more than one pre-molar on each side in the upper jaw, the hindmost of them which is close to the true molars is larger than the one or two nearer the canine (see figure, p. 292), and the latter are often inserted within the line of the row of teeth. The true molars are three on each side in both jaws; they are well-developed, and show the characteristic sharp W-shaped cusps very distinctly.

The Vespertilionidæ are all, so far as is known, strictly insectivorous in their habits. They are found generally distributed throughout the temperate and warm regions of both hemispheres. It is to

LONG-EARED BATS IN FLIGHT.

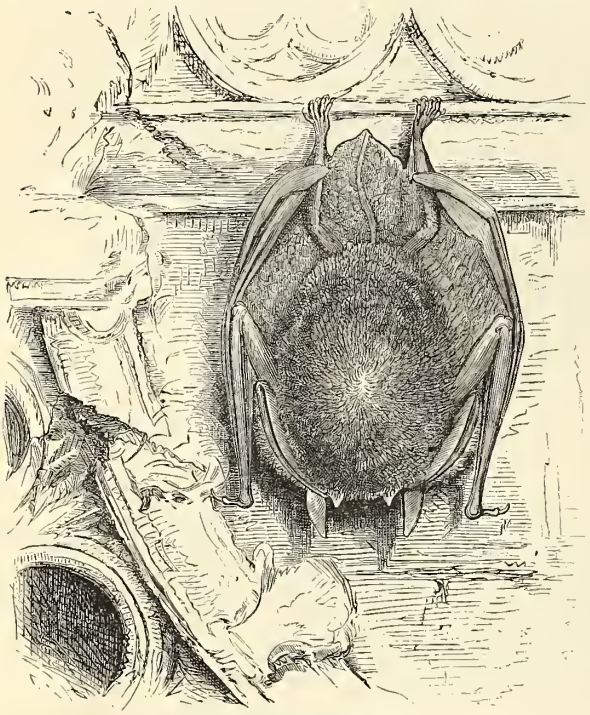
this family that nearly all the European Bats belong, and it includes all the British species, except the two Horseshoe Bats which have been already described.

THE LONG-EARED BAT.*

This common British species is known by the large size of the ears, which are united by their inner margins over the middle of the crown of the head. Hence this group, the *Plecoti* of authors, may be regarded as naturally forming a sort of stepping-stone from the Megaderms, with their extravagant dermal developments, to the more commonplace "Vespertiliones." In the Long-eared Bat this character is very striking, the ears being nearly seven-eighths as long as the head and body. The organs are quite thin and membranous, resembling those of the Megaderms already described, and they are traversed longitudinally by three thin threads of cartilage, which apparently serve by their elasticity to support the ears in an erect posture. From the middle thread of cartilage

* *Plecotus auritus.*

the inner margin of the ear is bent in, forming a sort of fold. A little above the base there is on each ear a small lobe, so placed that when the ears are erect these lobes touch each other. The outer margin of the ear ends opposite the base of the tragus, which is very long, tapering upwards. The tail, which is nearly as long as the head and body, is contained, all but the extremity of the last vertebra, in the ample interfemoral membrane, along the posterior margin of which the spurs extend fully half-way from the heel to the tip of the tail on each side. The fur in the Long-eared Bat is long, thick, and soft; the hairs are blackish at base, tipped above with brown, with a reddish or greyish tinge, which appears to vary with the age of the individuals, and beneath with pale brownish-grey. All the membranes are dusky, usually with a reddish or brownish tinge. The head and body in this species measures about one inch and five-sixths in length, and the tail is about one-sixth of an inch shorter. Its expanse of wing is ten inches.



LONG-EARED BAT SLEEPING.

This Bat occurs in nearly all parts of Europe and in North Africa, extending eastwards throughout Central Asia, but apparently not south of the Himalayas. Specimens from Northern Africa, even up to the fifth Cataract of the Nile, and from the desert regions about the Mediterranean and Caspian Seas, are described as having the fur paler and more ashy in colour, and the membranes also paler than those from more humid localities.

The Long-eared Bat is common, and pretty generally distributed in Britain, but is not so abundant or so well known as some other species. This may, perhaps, be in part due to the fact that it is a nocturnal species, coming abroad later than its fellows, and continuing on the wing in pursuit of the moths, which appear to constitute its chief prey, during the whole of the night. "At all hours," says Mr. Bell, "through the dead of the night, and in the darkest nights, in the open fields or elsewhere, we have heard the shrill chatter of the Long-eared Bat over our heads, its voice, once known, being easily recognised from that of any other species." Mr. Bell suggests, what may probably be true, that the great development of the ears in this (and probably other species) may be connected with the habit of flying late at night. It chiefly frequents the open country, taking up its abode in the roofs of tiled houses, especially in country villages, in which situations the Bats pass the day during the summer, suspended in clusters from the walls and timbers by the claws of their hind feet, and the whole winter cosily packed between the tiles and in various holes and corners. It also exhibits a predilection for church towers. When sleeping, the long delicate ears are not generally left exposed, but are folded down under the wings, where they are carefully tucked away. This is commonly the case when the Bat has settled down for its day's sleep, and always occurs during hibernation. When the ears are thus disposed of, the earlets or tragi still project from the head, giving the little creature the appearance of possessing only a pair of short pointed ears (see figure).

In captivity the Long-eared Bat soon becomes very tame and familiar. These Bats will fly about the room, play with each other, and may soon be induced to feed from the hand. "One kept by Mr. James Sowerby," as stated by Mr. Bell, "when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly towards it, and, pitching on the hand, take the fly without hesitation. If the insect was held between the lips, the Bat would then settle on its young

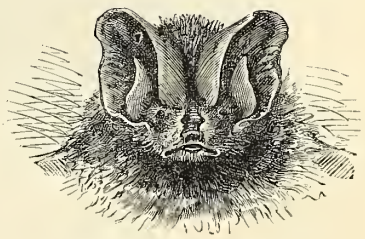
patron's cheek, and take the fly with great gentleness from the mouth; and so far was this familiarity carried, that when either of the young people made a humming noise with the mouth, in imitation of an insect, the Bat would search about the lips for the promised dainty." From an observation made by Mr. Tomes (Bell's "British Quadrupeds," second edition, p. 76), it would appear that the Long-eared Bat, even in freedom, habitually captures at least some of its food in a somewhat similar manner. He says that "having occasion to rise early—about three in the morning—on opening the window of his bedroom, a Bat of this species was seen actively engaged around the sprigs of a spindle-tree which extended across the window. It was in bloom at the time, and was surrounded by a cloud of Microlepidoptera, on which the Bat was feeding. As this took place scarcely four feet from the open window it was easy to see the whole proceeding, and to determine with certainty the manner in which the food was taken. With scarcely an exception, the moths were picked from the leaves while resting there, only one or two being taken on the wing. While thus occupied the Bat hovered much after the manner of the Kestrel, and the ears were bent outwards so much as to curl down the sides of the face, appearing more like two large cheek-pouches than ears, no part of them appearing of greater elevation than the crown of the head."

On the ground the progression of the Long-eared Bat is very peculiar. Bats in general run along the ground with the head and body in a nearly horizontal position, but the Long-eared Bat carries the fore part of its body raised, and advances by a series of jerks, first on one side and then on the other.

Several species nearly related to the Long-eared Bat have been described under various generic names. *Antrozous pallidus* is an inhabitant of North America, *Histiotus velatus* is found in Brazil, and *Otonycteris Hemprichii* occurs in Nubia.

THE BARBASTELLE.*

The Barbastelle is another British Bat belonging to the same group of the family Vespertilionidæ as the Long-eared Bat, but forming the type of a very distinct genus. The ears, instead of being elongated into great membranous organs half as long as the body of the animal, are only of moderate size, but they are united by their inner margins in the middle of the forehead a little in front of the eyes. The outer margin sweeps round upon the face, on which it terminates above the upper lip, so that the eye is almost completely surrounded by the ear. The tragus is triangular and pointed. The nostrils, as in *Plecotus*, open on the upper surface of the nose in front of a naked space, and from each nostril a deep groove runs down to the edge of the upper lip. The muzzle is short and blunt, giving the animal rather a surly aspect; the tail is nearly as long as the body, and enclosed in the interfemoral membrane, except the extreme tip; and the teeth are as in the Long-eared Bat.



HEAD OF BARBASTELLE.

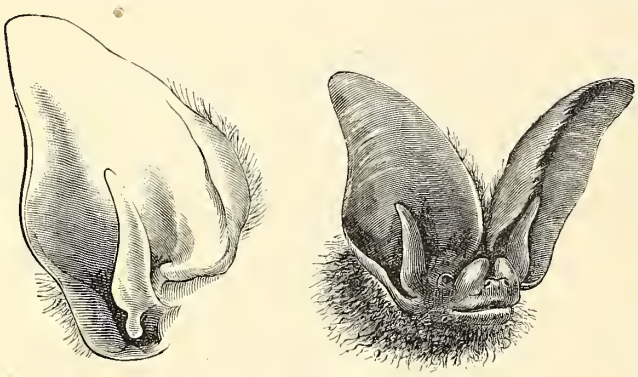
The Barbastelle is by no means a common Bat in England, where it seems to be confined to the Southern and Midland Counties, extending as far north as Northamptonshire and Warwickshire. It is found in France, rarely in Belgium and Germany, in Italy, Scandinavia, and Russia. In the southern part of the last-mentioned country it appears to be more abundant than elsewhere, especially in the Crimea, on the south coast of which it is said by M. Demidoff to be very common. It is said by Mr. Bell to occur in Nepaul, but the specimens referred to by him probably belong to the Darjeling Bat (*Synotus darjelinensis*) of Mr. Hodgson.

This curious little Bat measures about two inches in length of body, and its tail is about a quarter of an inch shorter. The expanse of its wings is ten inches. The cheeks are covered with black hair, which forms a sort of moustache. The ears are irregular in form, their tips being slightly truncated, and their outer margins sweeping in so as to form a notch, from which five or six folds run about half-way across the ear. The eyes are almost concealed by the black hairs on the cheeks. The

* *Synotus barbastellus.*

fur is long and soft, and of a brownish-black colour, with whitish tips, which are longer on the hairs of the lower surface. The membranes are dusky black.

In its habits the Barbastelle seems to be rather solitary; both in its places of repose and in its evening flights it is generally seen alone. It sometimes takes up its abode in caverns, but almost any place of retreat will suit it. Thus it may be found in the crevices of walls or trees, in the roofs of sheds, behind shutters, and in fact in almost any situation that offers it a chance of concealment. Its flight is peculiar, being a lazy, desultory sort of flutter, performed as if with no particular object; and according to Mr. Bell it is in the habit of approaching evening promenaders "so closely that the flutter of its wings may be heard, and even the cool air thrown by their movement felt upon the cheek." In captivity the Barbastelle is rather timid, and does not become familiar with its keeper after the fashion of its near relation, the Long-eared Bat; and when confined with other Bats it shows a certain sullenness of disposition, and an inclination to keep apart from its companions. A specimen received in winter by Mr. Bell from a chalk cavern at Chislehurst was very restless when awake, and was constantly biting at the wires of his box, as if endeavouring to escape. "When suffered to fly about the room, he flew very low, and less actively than any other under similar circumstances; and he was fond of lying before the fire on the hearthrug, where he appeared quite to luxuriate in the warmth."



EAR AND HEAD OF TOWNSEND'S BAT. (*After Allen.*)

In the second edition of "Bell's British Quadrupeds," a beautiful variety of this Bat from Alcester, in Warwickshire, is mentioned, having "the fur of the under parts, from root to tip, strongly tinged with purplish-red, or rose-colour." The authors also state that they have seen a perfectly white specimen of the species, and one in which the head and neck were of the ordinary dark colour, whilst the rest of the body was pure white. In both these specimens, which were young, the membranes were nearly white.

THE BIG-EARED BAT.*

Two North American Bats, allied to the Long-eared Bat and the Barbastelle, have been formed into a distinct genus by Dr. Allen. They have the ears very large, with the outer border carried forward, beneath the tragus, which is nearly half as long as the ear, tapering upwards, and furnished near the base on the outer side with a small circular lobe standing almost at right angles to the tragus. The sides of the nose bear large excrescences, which join with the inner margins of the ears. There are three pre-molars in the lower jaw, instead of two, as in *Plecotus* and *Synotus*.

The Big-eared Bat is a small species an inch and four-fifths long, with a tail nearly of equal length. It is clothed with a long, fine, and soft fur, the hairs of which are blackish at the base, with dusky-brown tips on the upper surface, and greyish tips below. This Bat is an inhabitant of the Southern Atlantic States of the Union.

Townsend's Bat (*Corynorhinus Townsendi*) is a very similar animal, but is a little longer, and has the face larger and broader and the facial crests more prominent. Its ear and head are shown in the annexed figures. The fur is brown above, with the bases of the hairs only a little darker than the tips, lighter beneath, and slightly rusty towards the base. It inhabits the central parts of the United States (Missouri, Utah).

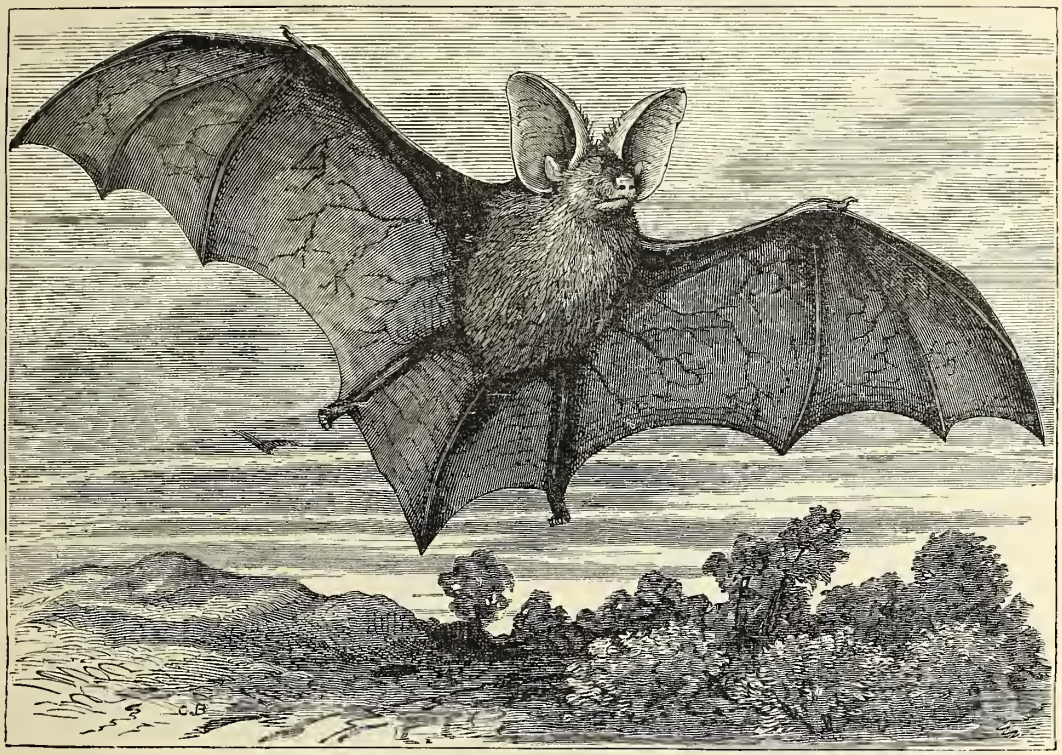
GEOFFROY'S NYCTOPHILE.†

The genus *Nyctophilus* includes a small number of Bats belonging to the Australian region, which, on account of their possession of a rudimentary nasal appendage, have usually been placed with

* *Corynorhinus macrotis.* † *Nyctophilus Geoffroyi.*

the *Megaderms* or the *Rhinolophidæ*. But apart from the presence of the nose-leaf, which is of very simple structure, the characters of these Bats are in such close agreement with those of the Vespertilionidæ, that there seems to be no doubt that this is their true position. They appear to be most nearly related to *Plecotus*.

The nasal appendages are very simple, consisting of a transverse front piece placed immediately above the nostrils, and having its upper margin straight, and a second portion, also transverse, placed at a greater distance from the first than the latter from the nostrils, and thickly clothed with short bristly hairs. The ears are large, ovoid, united at their bases by a membrane which runs across the top of the head, and furnished with a short broad tragus. The dentition differs from that of the allied genera. There are two separated incisors and only one pre-molar on each side in the



GEOFFROY'S NYCTOPHILE. (*From Gould's "Mammals of Australia."*)

upper jaw, and the lower jaw has only two pre-molars on each side. Thus the dental formula is—incisors, $\frac{1-1}{6}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{1-1}{2-2}$, molars, $\frac{3-3}{3-3}$.

Geoffroy's Nyctophile, which appears to be one of the commonest species, as also the one first described, is a small Bat, the head and body measuring rather more than two inches in length, and the tail more than one inch. The heel-spurs are half an inch long. The body is covered with long, thick, and soft fur, which is usually brown above and brownish-grey beneath, the hairs on both surfaces being black at the base, tipped above with olive-brown, and on the under surface with brownish-white. The membranes are dark brown. The species is an inhabitant of Western Australia, where it is abundant. These Bats are sometimes found in great numbers in the hollow spouts of the gum-trees, from which they emerge in the evening to flit about the shrubs and smaller trees in search of insects.

Three other species of this genus are known, one of which, although originally described as from Timor, and named *N. timoriensis*, is only known to occur in Western Australia; another is from New South Wales, and the third from Van Diemen's Land.

THE PIPISTRELLE.*

The commonest and most generally distributed of the British species is the Pipistrelle,† to which the local country name of Flittermouse is considered by Mr. Bell to be specially applicable. In this and the allied species forming the genus *Vesperugo*, the outer margin of the ear sweeps round on the cheek below the tragus, so as nearly to reach the angle of the mouth, and there is a small membranous lobe outside of the spur which runs from each heel into the interfemoral membrane. There are four incisor teeth in the upper and six in the lower jaw.

The Pipistrelle is of a reddish-brown colour above, paler beneath. The ears are about two-thirds

PIPISTRELLE IN FLIGHT.

of the length of the head, somewhat triangular, rounded at the tips, with the upper part of the outer margin deeply concave; the earlet, or tragus, is nearly half as long as the ear, and is of an oblong form with the apex rounded; the wings extend down to the base of the toes, and their membrane, like that of the ears, is of a dusky tint.

This Bat seems to occur abundantly in all parts of the British islands. It is also common on the continent of Europe, as far north as the central parts of Sweden, and southwards to the shores of the Mediterranean, extending thence eastwards through Russia into Siberia and Central Asia, but not passing to the south of the Himalayas. It is essentially an inhabitant of temperate regions. Its favourite resting-places in this country, according to Mr. Jenyns, are the crevices of decayed brick walls, the cracks of old door-frames, and behind the pipes which are attached to buildings for carrying off rain-water; and Mr. Bell describes it as taking shelter under the roofs of houses, and in crevices of buildings of every description, either inside or out. According to the second edition of Mr. Bell's work, a specimen

* *Vesperugo pipistrellus.*

† A name derived from the Italian equivalent of the word "Bat."

has been taken from a hole in the thatch of a low shed in a brick-field, another from a pile of hurdles in a stackyard, whilst a third was observed issuing from the spout of a disused wooden pump, and one was captured from behind a piece of loose bark on a pollard willow near Stratford-on-Avon.* The Pipistrelle is thus rather indiscriminate in its choice of a residence, and this may perhaps be due to the fact that its period of winter torpidity is shorter than that of any other species found in the countries which it frequents. With us it makes its appearance on the wing as early as the middle of March, and does not retire for its annual sleep until the winter season has decidedly set in; indeed, Mr. Gould once shot a specimen in the middle of a bright sunny day just before Christmas. Its food consists principally of small insects, especially Gnats, Midges, and other small two-winged flies, but it does not confine itself exclusively to such diet; raw meat possesses such attractions for it that this Bat not unfrequently makes its way into places where this is kept, and may be found clinging to a joint, and making a hearty meal upon it. In confinement, also, the Pipistrelle readily takes small pieces of raw meat as a substitute for its ordinary insect food, and it will become so tame as to take its nourishment from the fingers. On the ground the Pipistrelle runs with considerable ease and quickness, and Mr. Bell states, in opposition to the assertions of certain writers, that it can rise from a flat surface without difficulty. He says:—"We have often seen the Pipistrelle rise from a plane surface with a sort of spring, instantly expand its wings, and take flight. This was repeated by a single individual several times in the course of an hour, and without the slightest appearance of difficulty or effort; it was, on the contrary, evidently a natural and usual action." The same writer remarks that this Bat climbs with considerable agility, and in connection with this notices a peculiarity in the use of the tail which appears to have escaped other observers, namely, that it is used as an organ of prehension. The last joint of the tail projects a little beyond the interfemoral membrane, and "not only does the animal employ the tail in horizontal progression, in which case it assists in throwing forward the body, by being brought into contact with the ground on either side alternately, corresponding with the action of the hinder foot on the same side; but in ascending and descending a rough perpendicular surface, this little caudal finger holds by any projecting point, and affords an evident support. This is particularly conspicuous when the Bat is traversing the wires of a cage, in which situation the fact was first observed."

THE NOCTULE.†

The Great Bat, or Noctule, is another well-known British species, although far from being so abundant as the preceding. It is, however, even more widely distributed, being found in nearly all parts of the Eastern hemisphere, except the extreme north, but in tropical regions, according to Mr. Dobson, it seems to inhabit only the high grounds. In England it ranges as far north as Yorkshire. Its head and body measure about three inches in length, and its wings are about fourteen inches in expanse. Its fur is of a reddish-brown colour, nearly uniform throughout; the ears are ovate-triangular, shorter than the head, broad, and having the outer margin produced down upon the cheek below the level of the angle of the mouth; the ear-let is short, not more than one-third the length of the ear, broad, with the outer margin rounded and the inner one concave. The wing-membranes reach only to the ankle-joint, and there is a distinct lobe outside each of the spurs.

HEAD OF NOCTULE.

The Noctule seems to prefer for its resting-place the hollows of old trees, and generally to avoid buildings, although instances of its taking up its abode in or about the latter are not wanting. It is

* Mr. R. McLachlan, F.R.S., has mentioned to the present writer an instance which fell within his own experience of the dislodgment of a Bat from beneath a large piece of bark which was torn from a tree by an entomologist in search of Beetles or larvæ. When the bark was detached, the Bat fell, but the entomologist, being unprepared probably for such large game, omitted to secure it, and the species was not ascertained.

† *Vesperugo noctula.*

gregarious in its habits, considerable numbers often retiring together to the same hiding-place. Thus, in the second edition of Bell's "British Quadrupeds," a good many Noctules are said to have been "dislodged from a hole made by the Green Woodpecker in an elm by the insertion of a flexible stick;" and at Rugby, in Warwickshire, in a grove of old oaks, their excrement has been observed to form so thick a layer as to darken the ground under some of the oldest trees. Pennant states, on the authority of Dr. Buckworth (Buckhouse?), that one hundred and eighty-five of these Bats were taken in one night from under the eaves of Queen's College, Cambridge, followed by sixty-three on the second night, when the supply seems to have been nearly exhausted, as only two were captured on the ensuing evening.

The natural food of the Noctule consists of insects, and its jaws are sufficiently powerful to enable it to devour even such large and horny Beetles as Cockchafers, which, indeed, seem to constitute its favourite food. It is, in fact, most active during the period of the year when these insects abound, for White, who first noticed its occurrence in Britain, states that he never saw it at Selborne before the end of April, or later than the end of July. In Warwickshire, however, it has been observed as early as the 12th of March, and as late as the 18th of September. It flies very high, and on this account was named by White *Vespertilio altivolans*. Its course through the air is rapid and straight, and accompanied by a continual sharp and shrill cry, which ceases only during the capture and consumption of its insect prey. It is described by White as emitting a rancid and offensive odour.

Mr. George Daniell, in a paper communicated to the Zoological Society in 1834, published some notes on the behaviour of this Bat in captivity, which are particularly interesting from the description they contain of the birth of a young Noctule. Mr. Daniell obtained four females and one male of this species on the 16th of May, 1834. The male was very savage, biting the females, and breaking his teeth upon the wires of the cage in his attempts to escape. He refused to feed, and died on the 18th of May. The females, although at first sulky, fed after a time upon small pieces of raw beef, which they seemed to prefer to insect food. One of them died on the 20th, and two others on the 22nd; the survivor, which fed by preference upon the breasts and livers of fowls, lived on for rather more than a month. It passed the day suspended by the hind feet at the top of the cage, and came down in the evening to feed, which it did sometimes most voraciously; the quantity eaten exceeding half an ounce, although the weight of the animal itself was only two drachms. It rejected flies, but ate parts of some Cockchafers that were given to it. The animal was rather careful in cleaning itself, using the posterior extremities as combs, with which the hairs were parted on either side from head to tail, forming a straight line down the middle of the back. The membrane of the wing was cleaned by passing the nose through its folds. On the 23rd of June Mr. Daniell observed his Bat to be very restless, and this condition lasted for about an hour, the animal remaining as usual suspended by the hinder extremities. Suddenly "she reversed her position, and attached herself by her anterior limbs to a cross wire of the cage, stretching her hind limbs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane, so as to form a perfect nest-like cavity for the reception of the young, . . . which was born on its back, perfectly destitute of hair, and blind. The mother then cleaned it, turning it over in its nest; and afterwards, resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suckling. At the time of its birth the young was larger than a new-born Mouse; and its hind legs and claws were remarkably strong and serviceable, enabling it not only to cling to its dam, but also to the deal sides of the cage. On the 24th the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her usual position was reversed. In the evening she was found dead; but the young was still alive, and attached to the nipple, from which it was with some difficulty removed. It took milk from a sponge, was kept carefully wrapped up in flannel, and survived eight days; at the end of which period its eyes were not opened, and it had acquired very little hair."

From these observations of Mr. Daniell it appears that the period of gestation in the Noctule exceeds thirty-eight days, and they are of very considerable interest with respect to the general history of the Chiroptera, at any rate of the present family, for it is most probable that the conduct of this female Noctule on this interesting occasion is closely followed by other maternal Vespertilionidæ at the arrival of their "little strangers." Moreover, the fact of the production of only a single young

one, and the finding of only a single embryo in each of the three females which died soon after they came into Mr. Daniell's possession, taken in conjunction with observations to the same effect which have been made upon the female of the Pipistrelle, and of several other species of Bats, would seem to show that the Bats in general produce only one at a birth.

THE SEROTINE.*

Three other species of *Vesperugo* occur in Britain. One of these, the Serotine (*V. serotinus*), is nearly as large as the Noctule, and closely resembles that species in some respects in its habits. The head and body in the Serotine are about two inches and two-thirds in length; the ears are ovate-triangular, and a little shorter than the head; the tragus is a little more than one-third the length of the ear; and the extremity of the tail projects nearly a quarter of an inch from the membrane. The fur, which is soft and silky, is usually chestnut-brown above, and yellowish-grey beneath, but it is liable to vary more or less; British specimens being sometimes of a greyish tinge, whilst some from the Asiatic side of the Ural Mountains are described as having the upper parts yellowish cream-colour, and the lower surface yellowish-white. Like the preceding species, the Serotine is widely distributed, being found apparently over a great part of Europe, and throughout the temperate regions of Asia, at least as far east as the Himalayas; whilst specimens have been identified with it, which were brought from the northern parts of Africa, as far south as the mountains near the Gaboon. In England it is found only in the South-eastern counties, and is said to occur in the neighbourhood of London. Folkestone and the Isle of Wight are other recorded localities. In France it is not uncommon, frequenting the forests, and flying amongst the lofty trees; it is also found in the timber yards of Paris. Like the Noctule it is late in making its appearance in the spring, and it also flies late at night, whence its specific name. In France it bears one young one about the end of May.

THE PARTI-COLOURED BAT.†

Of the Parti-coloured Bat (*Vesperugo discolor*) only a single specimen has been taken in this country, and it was obtained by Dr. Leach many years ago at Plymouth. The probability is, as indicated by Mr. Bell, that this individual must have been conveyed to Plymouth in the rigging of some vessel. On the continent of Europe it is found chiefly in Russia and Germany, but does not extend into Belgium, Holland, and France. It has also been obtained from Central Asia and from the Himalayas. This Bat is of the same size as the Serotine, and is perhaps the handsomest of the European species, the fur of the upper surface being of a fine chestnut or deep brown colour, with the extreme tips of the hairs pale, or even sometimes white, giving the fur a finely-marbled appearance, while that of the lower parts is grey at the base and white at the tips, with a reddish-brown patch on the middle of the chest and belly. The ears are about two-thirds the length of the head, oval, and directed outwards (see figure), their outer margin produced nearly to the angles of the mouth, and their inner margin with a projecting lobe at the base. The Parti-coloured Bat is said to haunt towns, and to come abroad early in the evening.

HEAD OF PARTI-COLOURED BAT.

The Hairy-armed Bat (*Vesperugo Leisleri*) also for a long time founded its claim to be regarded as a British species upon a single specimen, but of late years it has occurred at several localities in the midland counties of England and in Ireland. It is a little smaller than the preceding species, the head and body measuring only two inches and a half in length, and is characterised especially by having a broad band of hair upon the wing-membrane along the whole course of the fore-arm. The fur is bright chestnut above and brownish-grey on the under surface. It is found generally about villages, and appears to take up its residence in buildings. On the continent it seems to be pretty generally distributed, and it extends, like the preceding species, over the temperate parts of Asia. Specimens have also been brought from the Azores and Madeira, and it is believed to live in Algeria.

* *Vesperugo serotinus.* † *Vesperugo discolor.*

Several other species of this genus have an almost equally wide range. Thus one that may be called the Negro Bat (*Vesperugo maurus*) is found along the whole of the great axis of elevation of the Old World from the Pyrenees into China, and even extends southwards into India, Cochin China, and Java. This species has a sooty-brown or deep-black fur, with the tips of the hairs greyish. Kuhl's Bat (*Vesperugo Kuhlii*) is found throughout India, and in Persia and Southern Europe, to Madeira. It is rather a small species, about an inch and three-quarters long, with black fur, tipped for one-fourth of its length above with yellowish-brown or dun-colour, and beneath with ash-colour. Another species, Nilsson's Bat (*Vesperugo boreadis*), which has the highest northern range of any species of the order, stretches right across the old continent, from Scandinavia and Germany as far south as the Hartz Mountains, to the Altai Mountains and North China. This species has a dark-brown fur, tipped with yellowish-brown above and with ash-colour beneath. It is about two inches long.

THE COROMANDEL BAT.*

Besides the preceding, which are common to Europe, there are a good many purely Asiatic species, mostly belonging to the Indian region and its islands. Mr. Dobson enumerates eighteen such species, the most generally distributed of which is the Coromandel Bat (*Vesperugo abramus*), which appears to represent in the southern parts of Asia the Pipistrelle of the more temperate regions. It is rather larger than the Pipistrelle, measuring an inch and three-quarters in length, and the outer margin of the ears is straight, or very slightly concave; the fur is dark-brown, tipped with light yellowish-brown above, and sooty-brown with pale tips beneath, and the head, face, and neck are yellowish-brown. This species is common in India and Ceylon, and extends thence through China to Japan, occurring also in several islands of the Eastern Archipelago.

Mr. Swinhoe says that it is a common house Bat at Nagasaki, in Japan. He also found it abundantly in Hainan, and, treating it as the common Chinese Bat, quotes the description of the Bat from the Chinese *Gazetteer*, in which, as is usual with Chinese writers, the animal is classed with birds. This choice description is as follows:—"Peenfoo, or Bat, shaped like a Mouse, has thin flesh-wings uniting the four legs, and extending to the tail. In winter stows away; in summer comes out. In daytime lies prostrate; in night flies. One name for it is Foo-yeh, or Belly-wings. It is now called Feishoo, or Flying Mouse."

THE THICK-FOOTED BAT.†

In this species, which inhabits Northern India, Tenasserim, the Andaman and Philippine Islands, and the Islands of Java and Sumatra, the bases of the thumbs and the soles of the feet are furnished with broad, fleshy pads, which on the feet form nearly circular discs, and are doubtless organs of adhesion, analogous to the more perfect sucking discs present in an American member of the family (*Thyroptera tricolor*). These organs probably assist the Bat in clinging to the under surfaces of large leaves and fruit, a habit which is common to many tropical species of Bats. It is remarkable that in this species, as in the *Thyroptera*, the claws on both the thumbs and the toes, although acute, are very small.

The Thick-footed Bat is about an inch and three-quarters in length of body, with a tail an inch and a quarter long. It is covered with a fine, dense, and moderately long fur, of a bright reddish-brown colour above, paler beneath. There is only one pre-molar on each side in the upper and two in the lower jaw, and this character, with the presence of the foot-pads, serves to distinguish the sub-genus *Tylonycteris* of Professor Peters, to which this species belongs.‡

TEMMINCK'S BAT.§

A few species, very nearly allied to the preceding, form the genus *Scotophilus*, in which the outer margin of the ear likewise comes down to the level of the angle of the mouth, but there are only two

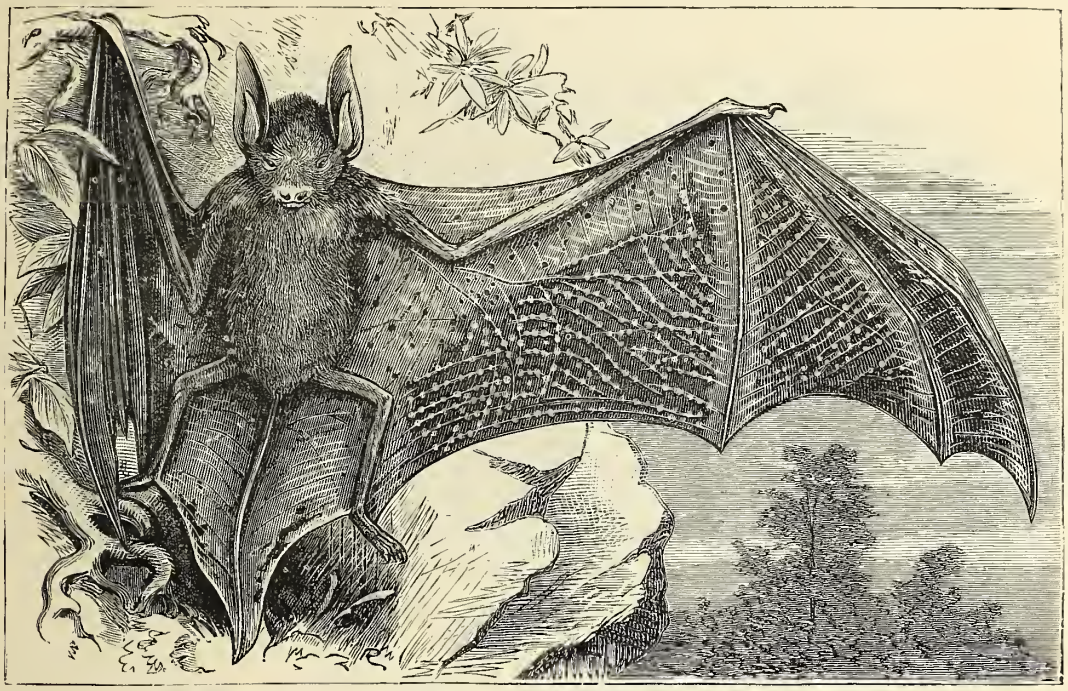
* *Vesperugo abramus.* † *Vesperugo pachypus.*

‡ Another Eastern species, furnished with pads on the thumbs and feet, is the Club-footed Bat (*V. tylopus*), from Northern Borneo, which is distinguished from the above by the presence of two pre-molars on each side in the upper jaw. A small African species, the Dwarf Club-footed Bat (*V. nanus*), is similarly provided.

§ *Scotophilus Temminckii.*

incisor teeth in the upper jaw, instead of four as in *Vesperugo*. These are stout-bodied Bats, with the muzzle nearly naked, the limbs strong, and the wing-membranes very thick and leathery, and scarcely encroached upon by hair. They are confined to the Eastern Hemisphere, and generally to its warmer parts, the species being found in Africa, Southern Asia and its islands, and in Australia. The best-known species is Temminck's Bat (*Scotophilus Temminckii*), which enjoys a wide range from India and Ceylon eastward through Burmah and Southern China to the Eastern Archipelago, extending to the Moluccas and Philippine Islands. It is rather more than three inches in length, and varies considerably in colour, but is generally dark olive-brown above, and reddish or yellowish-white beneath. The fur, as throughout the genus, is short and close. The ear is peculiar in its form, and its outer margin sweeps round on the cheek and terminates in a convex lobe; the tragus is narrow

HEAD OF TEMMINCK'S BAT. (*After Dobson.*)



WELWITSCH'S BAT. (*Half natural size.* From the *Proceedings of the Zoological Society.*)

and pointed, and considerably curved forwards and inwards. Temminck's Bat is very abundant in the countries which it inhabits, and is one of the most prominent species of the group, seeing that it lives in large bands, often of several hundred individuals, in the roofs of houses and in hollow trees, and that it flies very early in the evening, in fact before the commencement of twilight. Temminck says that it feeds principally on White Ants (*Termites*).

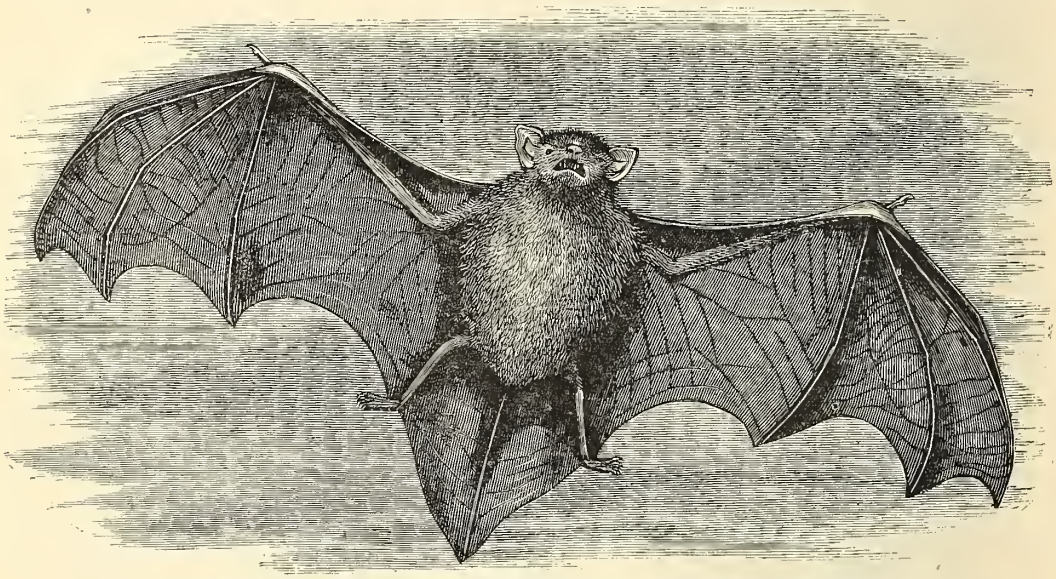
The Harlequin Bat (*Scotophilus ornatus*), another Indian species, is remarkable for its coloration, which is a pale tawny-brown, curiously variegated with white spots. It has been obtained in India, Burmah, and Yunan.

WELWITSCH'S BAT.*

This curious Bat, originally described by Dr. Gray from a specimen sent from Angola by the late Dr. Welwitsch, is especially remarkable for the brightness and variegation of its colours. The general tint of the fur is brown, the hairs being black at the base, with brown tips, which are longer and paler on the hairs of the lower surface, rendering the fur of that part paler than that of the back.

* *Scotophilus Welwitschii.*

The head also is pale, and the muzzle shows an orange tint, as do the ears, which are longer than the head, and rather acute, with a long pointed tragus, reaching nearly half-way up the ear. But the most striking peculiarity of the species consists in the colouring of the wings, which are yellowish-brown, dotted with black near the body, and beyond this chiefly blackish-brown, with numerous yellow dots arranged more or less regularly in curved lines, while a broad band of brownish-orange, bearing a few black dots, follows the course of the fore-arm, and gives origin at the wrist to three other bands of the same colour, one running down the margin of the wing and enclosing the first and second fingers, the other two following the course of the third and fourth fingers, and thus breaking the dark ground colour of the wing into three triangular patches. The occurrence of this peculiar mode of coloration in a Bat is the more remarkable as it is reproduced in at least two quite distinct species, namely, the Oriental *Vespertilio formosus* and *Kerivoula picta*, and in all these must probably subserve the same purpose, which Mr. Dobson with much justice supposes to be the protection of the animal by assimilating its appearance to that of withered leaves. The arms and legs in Welwitsch's Bat are yellow,



NEW ZEALAND BAT. (*Half natural size.* From the *Proceedings of the Zoological Society.*)

but the feet are black. The interfemoral membrane is yellowish-brown, with a few black dots, especially towards its margins. The length of the head and body is about three inches. Of the habits of this Bat nothing is recorded.

THE NEW ZEALAND BAT.*

Two species of Bats have been ascertained to inhabit New Zealand, and both present characters which isolate them systematically, just as much as their distant insular habitation does absolutely. The present species was discovered by J. R. Forster, the naturalist who accompanied Captain Cook, and described by him under the name of *Vespertilio tuberculatus*. It has short rounded ears; there are cutaneous lobes at the angles of the mouth, and three true molars on each side in both jaws. The upper incisors are in pairs, the inner ones much larger than the outer, and are separated from the canines; the pre-molars are small and pointed, and the molars of the ordinary form in the allied genera. The tragus is short, rather broad, and rounded at the tip. The wing-membranes spring from the base of the toes; the interfemoral membrane is large, and contains the long tail, of which the tip only projects; and the heel-spurs are long, extending one-third of the distance between the heel and the tip of the tail.

* *Chalinolobus tuberculatus.*

In its form and general proportions this Bat resembles our common British Pipistrelle, as also in the characters of the skull. In its dentition it has a still closer affinity to an Australian species, Gould's Bat (*Scotophilus Gouldii*). The fur is of a blackish-brown colour on the head and back, becoming chestnut-brown on the rump; the lower surface is of a similar colour, but browner, and becomes reddish-brown towards the tail. The hairs are of one colour throughout their length. The length of the head and body is rather more than two inches, and that of the tail about an inch and a half. This Bat inhabits the middle island of New Zealand. Nothing appears to be known of its habits.

THE MOUSE-COLOURED BAT.*

The genus *Vespertilio*, as now restricted, comprehends a very considerable number of species distributed in nearly all parts of the world. It differs from *Vesperugo* in having the outer margin of the ear terminated opposite the level of the tragus, and not produced towards the angle of the mouth, and is further characterised by the nostrils being simple and crescent-shaped, and scarcely projecting from the muzzle. Eight species inhabit Europe, and five of these are found in Britain.

The Common Bat of the continent of Europe, the Mouse-coloured Bat of Prof. Bell (*Vespertilio murinus*), is a large species more than three inches and a half in length. Its fur is of a pale reddish-brown colour above and greyish-white beneath, but with the bases of all the hairs black; the head is long, the ears oval, narrowed towards the apex, as long as the head, and the tragus is nearly half as long as the ear, narrow, pointed, with its inner margin quite straight. The membranes are of a yellowish-brown colour. *Vespertilio murinus* is met with in the north-western Himalayas, and extends thence through Syria into Northern Africa. It is common in Central and Southern Europe, but in England is one of the rarest Bats; in fact the only known British-caught specimen was taken (most conveniently) in the gardens of the old British Museum. Its claim to be considered indigenous rests, therefore, upon a very insecure foundation. In many parts of Europe, however, this species is exceedingly abundant, and lives by hundreds together, chiefly in church-towers and other similar localities, issuing forth in the evening to prey upon the insects which fly at that time. Moths are said to be its favourite victims, and the harder parts of these insects, with portions of the wings, are found unaltered in the Bat's excrements. Notwithstanding their social habits, these Bats are exceedingly quarrelsome; they fight vigorously with their sharp teeth and the claws of their thumbs, often tearing each other severely, and even breaking the slender bones in the wings of their adversaries.

HEAD OF MOUSE-COLOURED BAT.

NATTERER'S BAT.†

The Reddish-grey Bat, or Natterer's Bat (*Vespertilio Nattereri*), is an undoubted native of this country, although it appears to be local in its distribution. It has been taken near London, at Swaffham in Cambridgeshire, at Colchester and Norwich, at Chislehurst (hibernating in a chalk cavern), and at Arrow, near Alcester, in Warwickshire. It has also occurred in Ireland. It inhabits the continent of Europe from the Ural Mountains westward to Belgium and France, and in the south occurs on the shores of the Mediterranean. Apparently its range does not extend into Asia.

Natterer's Bat has the fur reddish-grey above, and whitish beneath, the hairs of which it is composed being dark towards the base, with light tips. The ears are oblong-ovate, and about as long as the head, and the tragus is nearly two-thirds the length of the ear; but the most distinctive character of the species consists in the margin of the interfemoral membrane, from the tips of the spurs to that of the tail, being fringed with a row of long stiff hairs. In its social habits this Bat seems to agree with the Mouse-coloured Bat, but is much more amiable in its disposition. Specimens received by Mr. Bell from a cavern in the chalk at Chislehurst (where they were found hibernating in company

* *Vespertilio murinus.* † *Vespertilio Nattereri.*

with several other species) were kept alive for a time by feeding them on bits of raw meat, and exhibited "great familiarity of disposition, not only by their friendliness towards their companions, but by their readiness in taking food from the hand, and in allowing themselves to be interfered with without evincing fear or anger." These Bats were active in their habits, running and climbing about the cage with great agility. The sociability of character of Natterer's Bat is still more strikingly shown by the curious description given in the second edition of Bell's "British Quadrupeds" of a colony observed in the roof of Arrow Church, near Alcester. In a dark retreat, between the ceiling of the church and the tiled roof, "the Bats were seen adhering, by all their extremities, to the under surface of the row of tiles which forms the crest or ridge of the roof (partly supported, however, by the upper tier of roof-tiles on which the ridge-tiles rested), and others clinging to them, until a mass was made up three or four inches thick, six or seven wide, and about four feet in length. It would be wrong to call this their place of repose, as they presented a most singular scene of activity, the constant endeavour of those outside being to penetrate the mass, probably for warmth; and to do this they were continually poking their noses between those nearest to them, and then forcing in their bodies, to be in their turn again pushed to the outside. In this manner a regular bickering was kept up in the whole mass. However, they seemed to be very gentle, and to have no idea of biting or otherwise annoying each other."

DAUBENTON'S BAT.*

Daubenton's Bat is another species which is almost confined to Europe. It is generally distributed over that continent from Finland and the Ural Mountains to Ireland and the Mediterranean, but is only of doubtful occurrence in North-western Asia. It is about two inches in length; its ears are about three-fourths the length of the head, oval, with the outer margin sinuated, and the inner margin folded in; the tragus is narrow, rather obtuse at the apex, and about half the length of the ear; the tail is longer than the body; the fur is usually reddish-brown, but sometimes dark brown or greyish-brown above, and ash-grey beneath; and the wing-membranes show a slight reddish tinge.

The habits of this Bat are very peculiar. It usually takes up its residence in church-towers and other buildings, but sometimes in hollow trees, and always in the vicinity of water, its active life being passed in flying over the surface of water. Its flight is not very rapid, and is performed by means of very slight but rapid strokes of the wings. It flies usually close to the surface, and from time to time dips its nose into the water, probably for the purpose of drinking. This Bat is gregarious in its habits, great flocks being generally seen flying about together, and considerable numbers always inhabit the same retreat. In confinement it seems to be very delicate, and does not live long; but it is quiet and gentle in its behaviour, and will drink milk from the palm of the hand, and feed upon small pieces of meat and house flies. The latter, according to Mr. Bell's editors, are favourite morsels with these Bats, and "it was curious," they say, "to see them poke their little noses between the fingers for flies which were concealed there. A fly put on a smooth table was always a tempting but tantalising bait for them, for the Bats, in attempting to take hold of it, almost invariably pushed it to the outside of the table, from which it fell and was lost." In this country, Daubenton's Bat has been taken in various localities, extending as far north as Aberdeenshire; and in Ireland it has occurred in Donegal and Kildare.

THE WHISKERED BAT.†

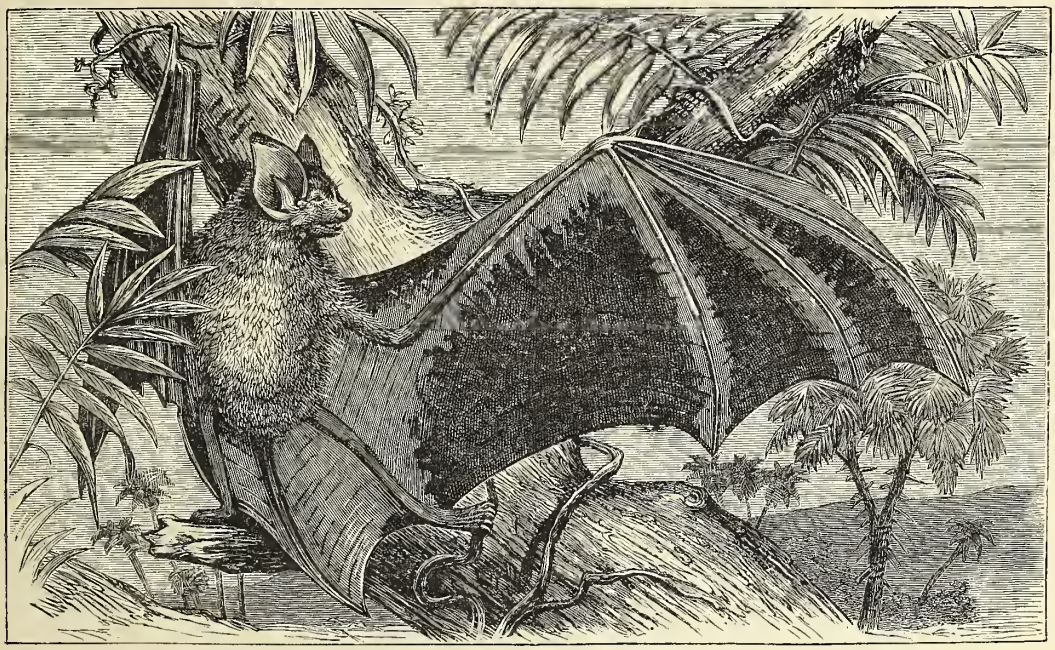
The Whiskered Bat inhabits all Central Europe from the Alps to Finland, and from Russia to Ireland. It is also found among the Himalayas, and is said by Schrenck to occur in the Amoor country, so that its distribution in Asia is probably rather wide. In England its occurrence has been recorded in Cambridgeshire, Northamptonshire, and Warwickshire, at Colchester and at Chislehurst, and in Ireland in the county of Clare. The Whiskered Bat is a small species, the head and body measuring only one inch and two-thirds in length. Its colour is dark chestnut-brown above, ashy-brown beneath; the ears bend outwards and have the outer margin notched; the tragus is half the length of the ear; the face is very hairy, and the hairs on the upper lip are longer than the rest, so as

* *Vespertilio Daubentonii.* † *Vespertilio mystacinus.*

to form a moustache, whence the name of the species. This Bat is solitary, being generally found singly in its resting-places, which consist of holes in walls, the roofs of houses, and, in general, any dark crevice or corner. It resembles the Pipistrelle in its flight and general habits, and is doubtless often mistaken for that species.*

THE BLACK AND ORANGE BAT.†

This species, which has been referred by various authors to different genera, is especially remarkable for its peculiar coloration. The muzzle is of a conical form; the ears ovate, with the rounded tips projecting outwards, so as to render the outer margin concave for some distance; the tragus long, narrow, and obtusely pointed; the fur is soft and thick, of a reddish-yellow colour above, and pale



BLACK AND ORANGE BAT. (*Two-thirds natural size.*)

yellowish beneath; and the wing-membranes, which are very broad, are singularly variegated with bright orange and brownish-black. The dark portions form irregularly triangular patches on the membranes between the second and third and third and fourth fingers, and between the fourth finger and a line drawn from the wrist to the ankle. All the rest of the membrane, including the ears and interfemoral membrane, are orange, this colour forming narrow bands along the course of the fingers, and also extending more or less in the form of specks and streaks over the dark patches. The length of the head and body in this Bat is from two inches and a third to two inches and a half, and the expanse of the wings twelve inches and a half. It is found in the Himalayan region in Nepaul and at Darjeling, in the Khasia Hills, and in China at Shanghai, Kiang, and Amoy.

This beautiful Bat presents a remarkable resemblance in coloration to another Eastern species

* Other European species are Bechstein's Bat (*Vespertilio Bechsteinii*), which has occurred in the New Forest; the Marsh Bat (*Vespertilio dasycneme*), which inhabits the Altai Mountains, and in Europe extends, according to Mr. Dobson, from Russia to England; Capaccini's Bat (*V. Capaccinii*), an inhabitant of Italy, with which specimens from the Philippine Islands and Japan have been identified; and the Notched-eared Bat (*V. emarginatus*), found in Central and Southern Europe, and extending eastward into Persia.

† *Vespertilio formosus.*

(the Painted Bat), to which we shall presently refer; and, indeed, by some zoologists it has been placed in the same genus (*Kerivoula*) with the latter. Mr. Swinhoe, in his memoir on the Mammals of Formosa (*Proc. Zoc. Soc.*, 1862, p. 357), refers to a species which he regards as allied to the Black and Orange Bat and the Painted Bat, but which was most probably the former, in the following terms:—"The body of this Bat was of an orange-brown, but the wings were painted with orange-yellow and black. It was caught, suspended head downwards, on a cluster of the round fruit of the Longan tree (*Nephelium longanum*). Now this tree is an evergreen, and all the year through some portion of its foliage is undergoing decay, the particular leaves being, in such a stage, partially orange and black. This Bat can therefore at all seasons suspend from its branches, and elude its enemies by its resemblance to the leaf of the tree. It was in August when this specimen was brought to me. It had at that season found the fruit ripe and reddish-yellow, and had tried to escape observation in the semblance of its own tints to those of the fruit." This example of "protective mimicry," if such is really its nature, is reproduced, as already stated, in the Painted Bat, and also, as remarked by Mr. Dobson, in Welwitsch's Bat from Western Africa.

THE PAINTED BAT.*

A small group of Bats, nearly related to the preceding, is distinguished as forming a distinct genus under the name of *Kerivoula*, originally proposed and founded on a native Cingalese name by the late Dr. Gray. These Bats have the apertures of the nostrils perfectly circular; the first and second pre-molars in the upper jaw nearly as large as the third pre-molar, the ears large and funnel-shaped, the outer portion sweeping forward very much, and the spur of the heel long and stout, and curved backwards.

The Painted Bat (*Kerivoula picta*) has been already referred to as one of the species remarkable for their coloration. It is a small species, having the head and body only an inch and a half to an inch and three-quarters long. Its fur is of a deep orange colour above and paler beneath. The ears and interfemoral membrane, and the portions of membrane in front of the bones of the arm, are likewise deep orange, as are also the basal portions of the wing-membranes, broad bands bordering all the bones of the arms and fingers, and the hinder margin of the portions of membrane between the feet and the extremities of the fourth fingers, and the remainder of the wing-membranes being occupied by large triangular patches of deep black, more or less variegated with orange spots and streaks.

This remarkable Bat is found in many parts of the Peninsula of India, and also in Ceylon, Burmah, Sumatra, and Java; in fact, Mr. Dobson thinks that it is probably distributed in all parts of tropical Asia. It haunts the forests, and is very active in pursuit of insects. When disturbed in the day-time, according to Dr. Jerdon, it looks more like a Butterfly or a Moth than a Bat, and we may easily believe that the character and arrangement of its colours will give it an exceedingly un-batlike aspect. For its place of repose it selects the folded leaf of the plantain, and, according to Dr. Kelaart, its native Cingalese name of "Kehelvoulha" (from which the generic name is derived) signifies "Plantain Bat." The other species of this genus present nothing remarkable.

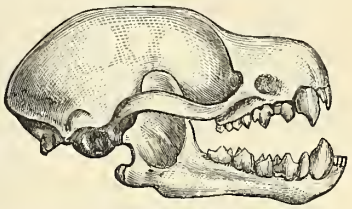
THE HARPY BAT.†

The *Harpiocephali* are a curious group of Bats almost entirely confined to the Himalayan region, only two species being found elsewhere, namely, in the islands of Java and Sumatra, and one of these is also a Himalayan species. The most striking character of the genus is one which it displays in common with the Harpy Fruit Bat (*Harpyia Pallasii*) already described, namely, the remarkable prominence of the nostrils, which project in a tubular form on each side of the muzzle. These Bats are further distinguished by the hairiness of the upper surface of the interfemoral membrane, which is sometimes entirely, and never less than half covered with hair, the wing-membrane being also generally hairy for a greater extent than in other allied species.

The Harpy Bat (*Harpiocephalus harpia*) is about two inches and a half long, with a tail nearly two inches in length. Its fur is very soft and silky, that of the upper surface brownish or

* *Kerivoula picta.* † *Harpiocephalus harpia.*

whitish-grey, with the tips of the hairs red, producing a bay or reddish-brown tint on the back, whilst the head, neck, and shoulders show more of a greyish cast; and that of the lower surface entirely grey. The membranes are of a reddish-brown colour, clothed above with hairs of the same tint on the basal part of the wings, and over the whole surface of the interfemoral membrane. The ears are broad, and rounded at the tip. This fine Bat has been observed in India, at Darjeling, and the Khasia Hills; it is also an inhabitant of Java and Sumatra.



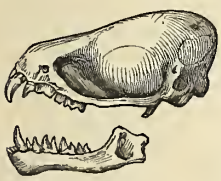
SKULL OF HARPY BAT, ENLARGED.

The skull and jaws in the Harpy Bat exhibit indications of considerable strength; in fact, the general aspect of the skull is very Dog-like, and the large size of the coronoid process of the lower jaw would seem to indicate that the whole is intended to form a powerful masticating apparatus. This notion is further borne out by the character of the teeth, which are very stout, the molars being furnished with short, blunt cusps, thickly coated with enamel, and admirably fitted to crush the hard cases of the Beetles, which appear, from the contents found in its stomach, to constitute the principal food of this Bat. Mr. Dobson remarks that "as we become better acquainted with the habits of these animals, it will probably be found that the food of this species is restricted to certain species of Coleoptera possessing extremely hard cases, which would effectually resist the feebler, although more acutely-pointed teeth of other Bats inhabiting the same localities. The form of the teeth, the great development of the coronoid process, and the shortness of the mandible, are all evidently subservient to the same object, and have been modified simultaneously to suit the food of the animal."

THE RED BAT.*

The genus *Atalapha*, to which the Red Bat of North America belongs, is very nearly related to *Nycticejus*, and in fact its species have been not unfrequently placed in that genus. In general characters the two groups closely agree, but the head in *Atalapha* is more elevated, and the interfemoral membrane is wholly, or to a very considerable extent, clothed with hair. This latter character, with the presence of only two incisors in the upper jaw, serves at once to distinguish the species of this genus, which are confined, like those of *Nycticejus*, to the Western hemisphere.

The Red Bat is generally distributed over all the temperate parts of North America, even extending, according to Peters, as far north as the Aleutian islands, whilst Geoffroy and Temminck state that it occurs in Cayenne and Surinam. The head and body are usually rather less than two inches long, and the tail is of about the same length; the expanse of wing is from eleven to twelve inches. There are two pre-molar and three molar teeth on each side. The ears are irregularly rounded, and the outer margin runs round upon the cheek, and forms a distinct lobe below the origin of the tragus, which is about half the height of the ear, and turns inwards at the point. The fur is long and silky, and is generally of a light russet colour, tinged with yellow, darker and richer on the back. The colour, however, varies, specimens being met with showing fawn-coloured and even yellowish-ashy tints. At each shoulder there is a tuft of white hair. The interfemoral membrane is entirely covered above, and half covered beneath, with hair of the same colour as that on the body. The membranes are of a rich brown colour, and the ears and lips are marked with yellow. The above furnishes indications only of the general effect produced, but each hair is dark lead-colour at the base, then yellowish-brown, passing into dark or bright red or chocolate colour, with the extreme tip generally white. Northern specimens usually show the darker tints, while those from warmer regions are more frequently of a bright red colour.



SKULL OF RED BAT. (*After Allen.*)

Dr. Allen quotes the following anecdote, illustrating the force of the maternal instinct in this little Bat:—A lad had caught a young Red Bat, which he took home with him. "Three hours afterwards, in the evening, as he was conveying it to the museum, in his hand, while passing near the place where it was caught, the mother made her appearance, and followed the boy for two squares,

* *Atalapha noveboracensis.*

flying around him, and finally alighted on his breast, such was her anxiety to save her offspring. Both were brought to the museum, the young one firmly adhering to its mother's teat. This faithful creature lived two days in the museum, and then died of injuries received from her captor. The young one being but half grown, was still too young to take care of itself, and died shortly after."

The Hoary Bat (*Atalapha cinerea*) is larger than its congener, the Red Bat, measuring from two to three inches in length, and from twelve to fifteen inches in expanse of wing. Its colours, also, are quite different. The head and neck are of a faded yellow colour, the back brownish chocolate or umber smoky fawn-colour, and the lower surface fawn-colour, darker on the breast. All the hairs are tipped with white, which gives the animal the peculiar ashy tinge alluded to in its name. The whole upper surface of the interfemoral membrane, and about one-third of its lower surface, are clothed with hair. The Hoary Bat is distributed over the whole of North America, as far north as Canada and the Hudson's Bay Territories.*

SCHREIBERS' BAT.†

Several species of Long-tailed Bats, peculiar to the Eastern hemisphere, have been formed into the genus *Miniopterus*, which differs from all the preceding forms by having the crown of the head abruptly and very considerably raised from the face, and the upper incisors in pairs separated not only from each other, but from the canines. They have the ears separate, with their outer margins extending forward nearly to the opening of the month; the nostrils simple; the first phalanx of the second finger very short; and the tail as long as the head and body, and entirely enclosed within the interfemoral membrane.

Schreibers' Bat, the type of this genus, is very remarkable for its extraordinary geographical range; for, according to the determinations of Messrs. Tomes and Dobson, it extends from Japan through the Eastern Archipelago to Australia, and westward of these localities through Burmah and Ceylon to Asia Minor, and thence into Southern Europe. It is also generally distributed in Africa, and occurs in Madagascar. On the continent of Europe it is found as far north as Switzerland and Lower Austria.

The species varies considerably in the colour of its fur. The basal half of the hairs is always dark, either brown, greyish-black, or black, with the extremities sometimes of nearly the same tint, but generally lighter, varying from a light grey, even becoming whitish on the lower surface, to reddish-grey and reddish-brown. Specimens from tropical localities are generally dark in colour. The ears are much shorter than the head, and sweep almost completely round the eye (whence the name of "*blepotis*" was given to the Eastern form by M. Temminck), terminating near the angle of the mouth in a small square-ended lobe. The tragus is much shorter than the ear, about twice as long as broad, and rounded at the tip. The total length of this Bat is about four inches, half of which goes to the head and body, and the remainder to the tail. Schreibers' Bat is an inhabitant of caves. It was originally obtained from the caverns of the Banat, but occurs generally throughout Southern Europe. In the East it is also said by M. Temminck to find a retreat in caves and clefts in the rocks. It is very common in Java, but rarely appears in the open country.‡

THE BROWN PIG BAT.§

This is another of the forms occupying the border-land between the families of *Vespertilionidæ* and *Emballonuridæ*, and assisting to unite the whole of the simple-nosed Insectivorous Bats in one great series. In the form of the head, and in the dentition, it resembles especially *Natalus* and *Furia*. The wing-membranes are continued down the toes to the base of the claws; the tail is long, and enclosed,

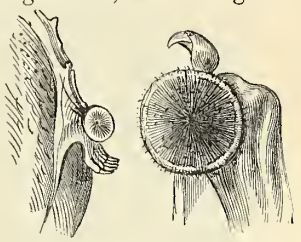
* Other recorded species of this genus are: *A. intermedia*, from Mexico, *A. Pfeifferi*, from Cuba, *A. Frantzii*, from Brazil and Costa Rica, *A. varia*, from Peru and Chili, *A. pallescens*, from Venezuela, and *A. Grayi*, from Chili, all with molars $\frac{5-5}{5-5}$; and *A. egregia*, from Brazil, *A. Eya*, from Brazil, and *A. caudata*, from Pernambuco and Chili, with molars $\frac{4-4}{5-5}$. *A. Grayi* has been said to occur at Juan da Fuca, in North America, and in the Sandwich Islands.

† *Miniopterus Schreibersii.*

‡ Other recorded species are *Miniopterus tristis*, from the Philippine Islands, and *M. australis*, from the Loyalty Islands.

§ *Thyroptera tricolor.*

except the last joint, in the interfemoral membrane, which is supported by long heel-spurs, beyond which there are membranous lobes; and the thumbs are free and clawed, and, like the soles of the feet, furnished with curious adhesive discs. The toes consist of only two phalanges each, as in the genus *Phyllorhina*. The genus was described by MM. Lichtenstein and Peters under the name of *Hyonycteris* (Pig Bat), in allusion to the elongated and truncated form of the muzzle, which has somewhat of a Pig-like aspect.



FOOT AND THUMB OF THE BROWN PIG BAT, ENLARGED.
(From the *Proceedings of the Zoological Society.*)

The singular adhesive organs mentioned above as occurring on the thumbs and feet of this Bat, are described in considerable detail by Mr. Dobson in the "Proceedings of the Zoological Society." He remarks that they constitute the only known instance of the possession by Mammals of prehensile organs at all resembling the sucking-discs of the Cephalopodous mollusca. "On the inferior surface of the thumb," he says, "from the base of the first phalanx, ... corresponding to the position of the ball of the thumb in other Bats, arises, by a short peduncle, a hollow suctorial disc about one-tenth of an inch in diameter. On the sole of the foot a similar but considerably smaller disc is placed, not in the same relative position, however, as in the thumb; for it covers the metatarsal bones, not the bases of the first phalanges of the toes." According to a Spanish writer, Señor Jimenez de la Espada, these discs were used by the animal to fasten itself to the fingers as it tried to bite, producing the same feeling as a key or thimble when applied to the tongue after sucking out the air; and it is added, "the muscular arrangement is such as to allow the animal to vary the diameter of the organ; and by their means the animals attached themselves to the sides of the box in which they are kept, although, when sleeping, they suspended themselves by the claws like other Bats." Mr. Dobson, however, by careful examination of the structure of the discs, convinced himself that the Spanish zoologist was mistaken in ascribing any muscular arrangements to these curious organs, which consist exclusively of an unusual development of the skin and subcutaneous tissue, amongst which a radiating cartilaginous structure probably gave rise to the notion of a special muscular apparatus. Mr. Dobson indicates further that the discs of the feet are supplemented by several small projections from the hinder border of the heel-spur, which are known to occur in no other species of Bat, and he regards the whole of these peculiarities as indicating that the animal is specially adapted for climbing, like the New Zealand Bat (*Mystacina tuberculata*), and that in all probability both these species are in the habit of capturing the insects on which they feed while crawling over the branches of trees.*

The Brown Pig Bat (*Thyroptera tricolor*) is an inhabitant of South and Central America. Its head and body are rather more than an inch and a half long, and the tail about an inch and a quarter. The fur is of a cinnamon-brown colour, paler beneath, and the wings dusky brown.†

THE STRAW-COLOURED BAT.‡

In this curious little Bat, as in *Furipterus* and *Miniopterus*, which with it form the links of connection between the two families of simple-nosed Insectivorous Bats, the crown of the head is also much elevated and separated from the muzzle by a strong depression. The nostrils are placed quite at the tip of the nose, and close to the upper lip (see figure, p. 312), the chin has a semicircular double row of warts, the ears are large, broad, somewhat pointed at the tip, which is turned outwards, so as to make the outer margin appear excavated, whilst below it sweeps round upon the side of the face as a free lobe, and the tragus, which is short, broad, and fleshy, rises from the end of a short stalk projecting horizontally from the inside of the opening of the ear. The wings are of moderate length, and rather broad, and are attached to the ankle in a most singular manner. Their point of attachment is not, as usual in Bats, on the outside, but on the inside of the ankle, so that a narrow strip of membrane has to cross

* Mr. Dobson's paper above referred to ("Proceedings of the Zoological Society," 1876, p. 526) contains some interesting particulars as to the occurrence of adhesive organs in Bats and other Mammals.

† A second species, *Thyroptera albiventer*, has been described by Mr. Tomes from the vicinity of the Rio Napo, near Quito. It is rather larger than the preceding, and of a reddish-brown colour above, with the lower parts pure white.

‡ *Natalus stramineus.*

over the terminal portion of the shank.

HEAD OF STRAW-COLOURED BAT.
(From the *Proceedings of the Zoological Society.*)

The thumbs are free; the legs and tail are long and slender; the latter, which consists of only seven joints, is longer than the head and body of the animal, and is almost entirely enclosed in the ample interfemoral membrane, the posterior margins of which are supported by long spurs springing from the heels. All the membranous parts, including the ears, are thickly marked with dotted lines. There are four incisor teeth in the upper jaw, placed in pairs, and separated by a space from the canines. There are three pre-molars in both jaws. (Dental formula—incisors, $\frac{2-2}{6}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{3-3}{3-3}$, molars, $\frac{3-3}{3-3}$.)

The Straw-coloured Bat measures about four inches in total length, fully one-half of which is occupied by the tail. It is clothed with a moderately-long fur, of a brownish-yellow colour, paler on the lower surface. The membranes are reddish-brown. It is an inhabitant of South and Central America.

CHAPTER V.

EMBALLONURINE ALLIANCE.

FAMILY V.—EMBALLONURIDÆ, OR THICK-LEGGED BATS.

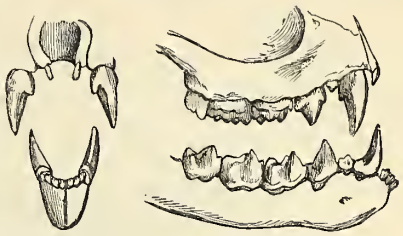
Characteristics of the *Emballonuridæ*, or THICK-LEGGED BATS—CUVIER'S FURY—The Genus *Saccopteryx*—STRIPED SACK-WINGED BAT—The Pouch or Sac in the Wing-membrane—Dentition—MOUNTAIN BAT—TOMB BAT—Origin of its Name—Dentition—The peculiar Sac or Pouch under the Chin—Other Species of the Genus (note)—EGYPTIAN RHINOPOME—Difficulty of assigning its true place in the System—Characteristics—GREAT HARE-LIPPED BAT—Seba's Description—Linnæus's Mistake—Dentition—Distribution—The Genus *Nyctinomus*—CESTONI'S BAT—PALE CHESTNUT MASTIFF BAT—Distribution—Habits—SMOKY MASTIFF BAT—Habits—COLLARED BAT—Hideous Ugliness—Characteristics—NEW ZEALAND SHORT-TAILED BAT—Characteristics—Mr. Dobson on the Wing-membrane, Thumb, and Foot.

THIS family is the first of the second great group into which Mr. Dobson divides the ordinary Bats, and it includes many forms which are almost as typically Bats as the *Vespertilionidæ* themselves. As in the *Vespertilionidæ* the nostrils are simple, that is to say, they are quite destitute of foliaceous appendages, except in one curious genus (*Rhinopoma*), which has a very small nose-leaf. The character of the folding of the first phalanx of the middle finger in repose upon the upper surface of the metacarpal bone has already been mentioned as distinguishing the members of this alliance generally. It is subject to two exceptions in the present family, being extended in a line with the metacarpal bone, in the same way as in the Vespertilionine Bats, in the curious genus *Noctilio*, and folded *beneath* the metacarpal in the equally singular genus *Mystacina*. In the latter genus, moreover, the middle finger has three phalanges, the number of these bones in all other *Emballonuridæ* being two. The legs are short and stout, and have the two bones of the shank (tibia and fibula) nearly equally developed; the tail has its basal portion enclosed within the interfemoral membrane, but perforates this on the upper surface, at or beyond the middle, and is usually continued as a free organ for a considerable distance beyond this point; and the upper incisor teeth are generally two in number.

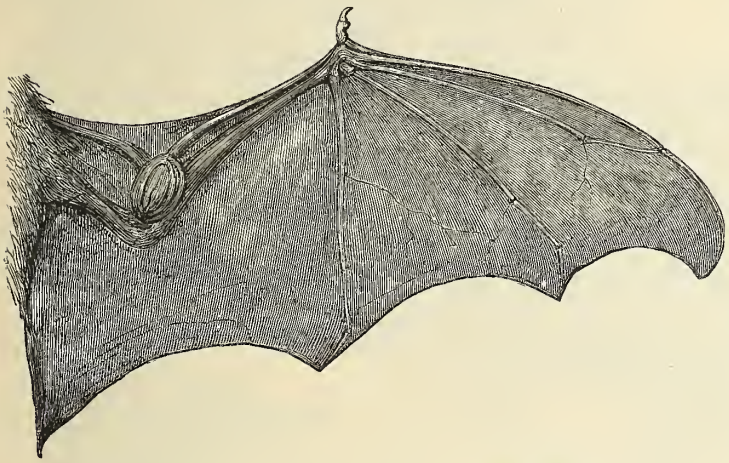
The members of this family, which are insectivorous in their habits, are chiefly confined to the tropical and sub-tropical regions of both hemispheres. A single species inhabits Europe, and one is found in New Zealand.

CUVIER'S FURY.*

A curious little South American Bat, described by F. Cuvier under the name of *Furia horrens*, is of interest to the zoologist as one of the links between the two great groups of Microchiroptera. It is remarkable for the form of its muzzle, which is somewhat Pig-like, cut off and turned up at the extremity, and bristling all over with hairs. The tragus is in the form of a barbed arrow-head; and the thumb is exceedingly short, and entirely enclosed within the membrane, only the claw being left free. The canine teeth in the upper jaw are very peculiar, showing four points. This Bat is only about an inch and a half long. Its eyes are large and prominent, its nostrils surrounded by slightly-raised borders, and its chin bears eight white warts, seven running round the lip, while the eighth stands in the centre. The fur is soft, thick, and black. A second species of the genus, also from South America, is described by Mr. Tomes under the name of *Furipterus cœrulescens*. Its fur is of a slaty blue tint.



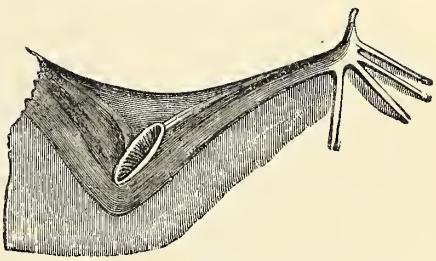
DENTITION OF STRIPED SACK-WINGED BAT, ENLARGED. (*After Peters.*)



WING OF STRIPED SACK-WINGED BAT, FROM BELOW.

THE STRIPED SACK-WINGED BAT.†

The genus *Saccopteryx* is readily distinguished from all others by the existence in the membrane in front of the arm (the shoulder membrane or antebrachial membrane) of a singular sac or pouch, which is situated on the lower surface of the membrane near the elbow, and opens at the upper surface in a corresponding position.‡ This sac is not peculiar to the males, but occurs in both sexes. There are in the upper jaw only two incisor teeth, which are small and separated by an interval from each other and from the canines (see figure above). The lower jaw has six incisors in a close row. The canines are strong and sharp, especially the upper ones; the first pre-molar is small, the second larger and acute, and the three true molars are large and strongly tubercular. The ears are of moderate size, and furnished with well-developed tragi. The interfemoral membrane occupies the whole space between the legs, and is stretched by a pair of long spurs, between which the hinder margin is either straight or incurved, and the basal portion of the short tail is enclosed in the membrane, from the upper surface of which its tip projects. The species of this genus are all American.



ARM OF STRIPED SACK-WINGED BAT, FROM ABOVE.

The Striped Sack-winged Bat is rather a small species, measuring about two inches and a quarter from the tip of the nose to the base of the tail. Its fur is tolerably long, full, and lustrous, that of the upper surface dark brown, with two white streaks running

* *Furipterus horrens.* † *Saccopteryx bilineata.*

‡ In one species, *Saccopteryx plicata*, from Costa Rica, of which Professor Peters makes his genus *Balantiopteryx*, the sac is placed in the middle of the shoulder membrane. In this species, also, the facial part of the skull is inflated on each side. In *S. canina* and its allies the sac is in the margin of the membrane. These form the genus *Peropteryx* of Professor Peters.

down from the shoulders to the hinder extremity of the body; the lower surface is paler, the hairs having ashy tips. It is an inhabitant of Surinam.*

THE MOUNTAIN BAT.†

This species is an example of a small series of Bats which, although nearly allied to the preceding, are inhabitants of the Eastern hemisphere, the known species of the genus *Emballonura* being found in the Eastern Archipelago and Australia, and of some of the oceanic islands of the great Pacific. The ears in this genus are somewhat triangular in form, with the outer margin sinuated;

THE MOUNTAIN BAT.

the tragus is truncated, slightly widened at the tip, and furnished with a small blunt projection at the base of the outer margin; the muzzle is somewhat elongated, with curved nostrils situated in a rounded pit; the interfemoral membrane is large, and stretched by long spurs. There are four incisor teeth in pairs above, and six below, and two pre-molars and three molars on each side in each jaw.

The Mountain Bat (*Emballonura monticola*) is a very small creature, measuring only an inch and a half in length, with a tail nearly half an inch long, the extremity of which protrudes from the back of the interfemoral membrane. The wing-membrane springs from the ankle. The general colour of the fur is a chocolate-brown, lighter on the lower surface, the hairs being in all parts chocolate-brown at the tips. Their basal portions are yellowish-white on the back and brown on the belly. The membranes are entirely naked.

This Bat is an inhabitant of Java, Sumatra, Borneo, and the Philippine Islands, where it lives in the wildest and most solitary regions of the mountains. It is social in its habits, considerable troops

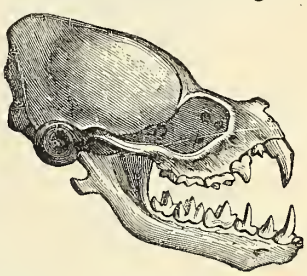
* Other described species of the genus are *Saccopteryx canina*, from Brazil, Guiana, Venezuela, and Guatemala; *S. leptura*, from Surinam; *S. villosa*, from Brazil; *S. Kappleri*, and *S. leucoptera*, from Surinam; *S. brevirostris*, from Brazil; and *S. plicata*, from Costa Rica. *Rhynchonycteris naso*, the Sharp-nosed Bat, is allied to these, but distinguished especially by its very pointed snout. It inhabits Brazil, Surinam, and Guiana.

† *Emballonura monticola*.

of them sleeping suspended from the surfaces of perpendicular rocks, under the shade of the overhanging trees and shrubs. They are said to be unsavoury little beasts, their presence being perceptible, even at a considerable distance, by the strong and disagreeable odour with which they contaminate the air.*

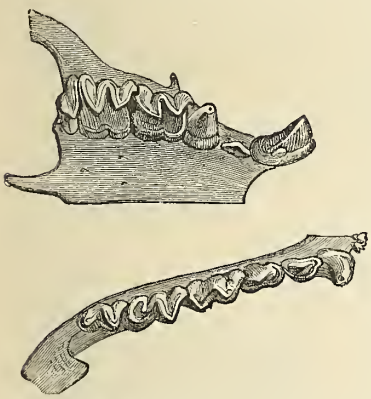
THE TOMB BAT.†

During the French expedition to Egypt under the first Napoleon, M. Geoffroy, one of the *savants* who accompanied the army, discovered a species of Bat inhabiting the tombs of the ancient kings of Egypt, which differed in many important characters from all previously known Bats. He made it the type of a new genus, to which he gave the name of *Taphozous*, in allusion to its tomb-haunting habits. Some other species have since been discovered in various parts of the Eastern hemisphere.



SKULL OF TOMB BAT, ENLARGED.

The *Taphozoi* have a rather short and broad head, with a tapering muzzle, its breadth behind the eyes being due to the wideness of the zygomatic arches. The ears are separate, and their outer margins sweep round upon the cheek, terminating near the angle of the mouth; the tragus is short, somewhat widened at the apex, so as generally to have a hatchet shape; the wings are long and narrow, and the interfemoral membrane is ample, and stretched by very long spurs, between the tips of which its hinder margin is concave; the base of the tail is enclosed in the membrane, from which its tip projects. The teeth, especially the canines and upper true molars, are powerful, and the latter show the W-shaped cusps very distinctly. There are three molars and two pre-molars in each jaw, but in the upper jaw the hindmost molar is reduced to a narrow transverse plate, as shown in the figure, and the first pre-molar is so small as scarcely to project above the gum. In the lower jaw there are four small incisors; but in the upper jaw the pre-maxillary bones are represented only by cartilage, which in the young, and sometimes in adult animals, bears a pair of minute teeth, separated from each other by a wide space, but these apparently frequently drop out as the animal advances in age. In consequence of this structure, the skull presents a peculiar appearance. The intermaxillary cartilage being lost, the front of the face presents a deep notch between two projecting processes which bear the canine teeth, and even during life the lower jaw extends further forward than the upper one, so that its incisor teeth press only against the upper lip.



DENTITION OF TOMB BAT, ENLARGED.

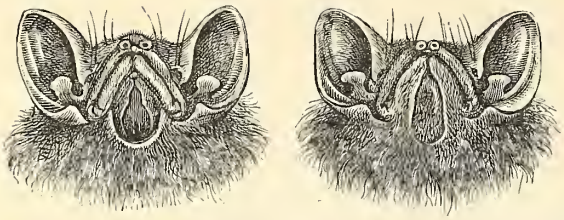
Another curious character presented by most of these Bats is the existence under the chin of a peculiar pouch (see figure, p. 316), which sometimes occurs in both sexes, although smaller in the females, and is sometimes altogether wanting in the latter. In some, the place of this sac, which is evidently of a glandular nature, seems to be represented by a group of small pores. The purpose of this peculiar arrangement is not clearly known; but from the greater development of the organ in the males of those species which possess it, it would appear to be of a sexual character. The peculiar wing-pouches which characterise the genus *Saccopteryx* are wanting in these Bats; but in most of them there is a small membranous band, enclosing the angle formed by the tip of the fore-arm and the base of the fifth finger, and thus forming a little pouch.

The Tomb Bat (*Taphozous perforatus*) is one of those which presents a pouch of this description, and the male also possesses a large throat-sac, which is altogether wanting in the females. It is about three inches in length, exclusive of the tail, which is thin at the extremity; the wing-membranes

* Other known species are *Emballonura nigrescens*, from Amboyna, Ternate, and Australia; and *E. semicaudata*, an inhabitant of the Samoa, Fiji, and Pelew Islands. An allied African species is *Colëura afra*, which, however, presents some characters indicating a relationship to the American *Saccopteryx*.

† *Taphozous perforatus*.

extend down to within about a quarter of an inch of the ankles, and the heel-spurs are about as long as the tibia. The body is covered with short dark-brown fur, which extends over the bases of the wings, and down the interfemoral membrane as far as the point where the tail emerges from it.

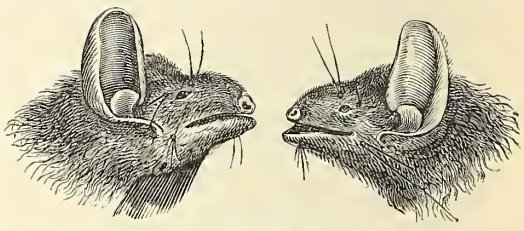


HEAD OF MALE AND FEMALE LONG-ARMED BAT. (*After Dobson.*)

This is the species originally discovered by Geoffroy in the chambers of the Pyramids, and other tombs and buildings in Egypt. It is said also to inhabit Sennaar and Senegal. It flies in the evening, passes the day in the darkest places it can find, and feeds exclusively upon insects. These habits, indeed, appear to be common to all the species of the genus.*

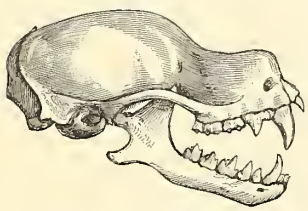
THE EGYPTIAN RHINOPOME.†

This Bat, described by the French traveller and naturalist Belon, about the middle of the sixteenth century, under the name of the Egyptian Bat (*Chauve-Souris d'Egypte*), is one of the most singular members of the order Chiroptera. It presents so curious a combination of characters that its place in the system has always been uncertain; and owing to the presence of a small nose-leaf, it has hitherto been arranged by different writers with the *Phyllostomata*, the *Rhinolophidæ*, and the *Nycteridæ*. Its true place, according to Mr. Dobson's recent researches, appears to be with the *Emballonuridæ*, with which, and especially with the *Taphozoi*, it certainly agrees closely in the form of the skull and the dentition. This view of the relationships of the genus *Rhinopoma* seems also to have struck Cuvier, who, while placing the genus next to *Nycteris*, makes *Taphozous* immediately follow it.



HEAD OF MALE AND FEMALE BLACK-BEARDED BAT. (*After Dobson.*)

The genus is characterised by having the crown of the head considerably elevated, with a deep concavity in the forehead between the eyes, as in *Taphozous;* the muzzle considerably elongated beyond the opening of the mouth; the nostrils of valvular structure, situated in the anterior margin of a very small, erect nose-leaf, which bears some resemblance to those of the Phyllostomes; the ears rather large, united upon the forehead (a Nycterid character), and furnished with a well-developed tragus; and the tail long and slender, and free throughout almost its whole length from the interfemoral membrane, which is exceedingly short. The upper incisors are two in number, and of very small size, inserted in intermaxillary bones which unite with the maxillaries by slender processes, a character which also occurs in *Emballonura*. In the lower jaw there are four incisors in a close row. The canines are strong, and followed on each side by a single pre-molar in the upper, and two in the lower jaw; and there are three true molars with W-shaped cusps on each side in both jaws: thus the dental formula is—incisors, $\frac{1-1}{4}$, canines, $\frac{1-1}{1-1}$, pre-molars, $\frac{1-1}{2-2}$, molars, $\frac{3-3}{3-3}$. The index-finger consists of three joints, a metacarpal bone and two phalanges, a structure which occurs in no other Insectivorous Bats.



SKULL OF RHINOPOME. (*After Dobson.*)

* Other described species of the genus are:—*Taphozous longimanus*, with a large throat-sac in the male, found in India, Ceylon, and Burmah; *T. melanopogon*, with no throat-pouch, but usually with a small black beard under the chin (see figure above), an inhabitant of India, Penang, Burmah, Cochin China, Java, and the Philippine Islands; *T. Theobaldi*, from Tenasserim; *T. australis*, from Australia and New Guinea; *T. mauritianus*, with white wings, from tropical Africa, Madagascar, and the Mascarene Islands; *T. saccolaimus*, from India and the larger Eastern islands; *T. affinis*, from Labuan; and *T. Peli*, from tropical Africa. The Valve-tailed Bat (*Diclidurus albus*), a native of Brazil, is remarkable for its whitish colour, and especially for the presence of a curious horny case, composed of two parts, which covers the extremity of the tail, and is attached to the upper surface of the interfemoral membrane.

† *Rhinopoma microphyllum.*

The Egyptian *Rhinopome*, which is probably distributed over a considerable portion of the African continent, is a small Bat, the length of the head and body being only about two inches and a quarter. The portion of the tail free from the membrane is about the same length as the head and body, and the interfemoral membrane encloses about another half-inch. It has a nearly naked face, along the middle of which a narrow groove runs back from the base of the little nose-leaf to the deep concavity situated in the forehead between the eyes ; the wing-membranes are attached to the tibia for about two-thirds of the length of the latter, and are entirely free from hair ; and the small development of the membranes, coupled with the comparatively great length of the limb-bones, renders this Bat more active in walking than most of his fellows. The fur is short, and leaves a good deal of the hinder part of the back naked ; and the bare skin thus exposed, as well as the base of the wings, is curiously wrinkled, a character which this species has in common with certain species of *Taphozoi* and *Molossi*.

EGYPTIAN RHINOPOME.

The Egyptian Rhinopome is found commonly in Egypt, where it frequents the numerous ruins and old buildings with which that country abounds, and is particularly abundant in the dark galleries and chambers of the Pyramids.*

THE GREAT HARE-LIPPED BAT.†

In Seba's well-known illustrated book on Natural History a peculiar species of Bat is described and figured under the name of "*Vespertilio cato similis Americanus*." It may be doubtful whether any of our domestic Grimalkins would be much flattered by the likeness thus briefly indicated (see figure), but there can be no doubt that the animal in question was a Bat, and as such it duly appears in the earlier editions of the "Systema Naturæ" of Linnæus. By a curious misapplication of the very sound principle of not being guided exclusively by external characters, the great Swedish naturalist was led in the last edition of his work (in which he founded the genus *Noctilio*) to refer the animal to the Rodents, on the ground of the apparent presence of only two incisors in each jaw.

A glance at the dentition of a *Noctilio* will at once show how Linnæus was misled, and at the same time that it has all the dental characters of a Bat. In the upper jaw there are four incisor teeth, the two middle ones approximated and considerably larger than the lateral ones, which are placed quite behind them, leaving a small open space between the incisors and the larger canines, behind which comes a series of four molars showing the characteristic W-shaped cusps very distinctly. In the lower jaw there are only two small notched incisors, followed immediately by the powerful canines, behind which is a series of five molars, the first very small, the second larger, but simple and pyramidal, and the remainder with distinct cusps and ridges.

HEAD OF GREAT HARE-LIPPED BAT.

The ears in the Bats of this genus are rather large, and furnished with a small tragus, the outer margin of which is notched. The outer margin of the ear forms a rounded lobe upon the cheek, and is then continued to the angle of the mouth. The upper lip is widely cleft, forming a broad margined fissure running up to the nostrils, which are surrounded by borders raised to such an extent as to

* *Rhinopoma Lepsianum* (Peters), is another African species. It inhabits the banks of the Blue Nile.

† *Noctilio leporinus*.

give them almost a tubular appearance; and the lower lip, which is also thickened, bears several curious folds of skin; the whole in combination giving a most singular and forbidding expression to the little creature. The wing-membranes descend but little below the knee, but the interfemoral membrane is ample, stretched by very long spurs, and traversed in its basal part by the short tail, the tip of which projects from its upper surface like a little knob.

The Great Hare-lipped Bat (*Noctilio leporinus*), which is distributed over the whole of tropical and sub-tropical South America, from the West Indies in the north to Paraguay and Chili in the south, is about three inches and three-quarters in length without the tail, and has an expanse of wing of about twenty-one inches. The general colour of the fur on the back is greyish-brown or reddish-brown, but in many specimens a yellowish-white streak runs from the nape down the middle of the back to the root of the tail. The throat, neck, and belly are reddish-yellow, the ears, membranes, and other naked parts blackish-brown. The interfemoral membrane extends about two inches beyond the tail, which is three-quarters of an inch long, and the heel-spurs are more than an inch in length.

This Bat lives in large parties in hollow trees, caverns, the roofs of buildings, and even among the dense foliage of trees, but generally in the immediate vicinity of water. In the twilight they are seen in great numbers flying, almost in the same way as the Swallows in Europe, in great flocks over the surface of the water, close to which they skim with a very rapid flight in pursuit of the insects which constitute their food. The voice is described by Prince Maximilian of Neuwied as a hissing sound. According to an observation made by Mr. Louis Fraser in Ecuador, the object of the *Noctilio* in haunting the waters is not so peaceful as that of most bats, which, so far as we know, resort to the lakes and rivers only to drink. Mr. Fraser describes it as flying along the banks of rivers, and from time to time dashing down upon the surface of the water, where it captures small Crustaceans as they swim up the stream. He adds that the Bats have a fishy odour, and possibly they do not strictly confine themselves to invertebrate prey.*

CESTONI'S BAT.†

We come now to a series of Bats (the *Molossi* of Professor Peters and Mr. Dobson) which we shall treat here as belonging to three genera, the classification and nomenclature of which are attended with considerable difficulty, partly owing to the variability of characters on which we are accustomed to rely in the definition of generic groups, and partly to the confusion which has arisen in the use of the generic names employed especially by the older writers. They are all stoutly and rather clumsily built Bats, with short, thick muzzles, a character which has obtained for some of them the name of Bulldog Bats; the tail is thick, and projects beyond the margin of the interfemoral membrane, the hinder limbs are short and stout, and the fibula or second bone in the shank is well developed, often nearly as large as the tibia.

In the genus *Nyctinomus*, as we shall here restrict it, the ears are large, and generally united upon the forehead or on the muzzle in front of the eyes, either directly or by a fold of skin, and furnished with a distinct tragus, and the upper lip is more or less distinctly folded or wrinkled. The intermaxillary bones are generally separated by a cleft; and in all the species they bear two incisor teeth, which are separated by a space from each other and from the canines, whilst the lower jaw has six incisors in young animals, and usually only four in the adults. The canines are strong, and followed in the upper jaw by either four or five teeth, the number of premolars being either one or two. In the lower jaw there are always two premolars, and three true molars. The first and fifth toes are much thicker than the rest. The species of this genus occur in the warmer parts of both hemispheres.

SKULL AND FRONT TEETH OF CESTONI'S BAT. (*After Temminck.*)

Cestoni's Bat, originally discovered at Pisa, is the only species of the group that occurs in Europe, and forms the type of the genus *Dinops* of Professor Savi, now regarded as a sub-genus of *Nyctinomus*. It is one of the species with five molars in each jaw, and six incisors permanently in the

* The White-bellied Hare-lipped Bat (*N. albiventris*) is also an inhabitant of South America.

† *Nyctinomus Cestonii*.

lower jaw; and the tail extends for fully half its length beyond the interfemoral membrane, which is small, and stretched by long curved heel-spurs. A small membranous band crosses the shank, uniting the wing with the interfemoral membrane. The general colour of the fur is a mouse-grey, paler below; on the backs of the toes there are some long white hairs. The wings in this and the other species of *Nyctinomus* are long but narrow; the second finger, which runs to the tip of the wing, being very long, so long indeed that its metacarpal bone alone exceeds the fourth or hindmost finger in length. The inner toe also is rather larger than the rest, and somewhat separated from them, without, however, taking on the form and function of an opposable thumb. The head and body in this Bat are about three inches and a quarter long, and the tail rather more than two inches, of which about an inch is within the interfemoral membrane. It has a very wide distribution, being found in the South of Europe and throughout Northern Africa, and occurring also at Amoy, in China, where Mr. Swinhoe obtained specimens of it. He describes the interfemoral membrane as fitting loosely on the tail like a glove, so that it can slip up and down at the will of the animal. It flies high in the air, where it can be readily distinguished by the narrowness of its wings. A specimen that Mr. Swinhoe kept for some time alive would slip the interfemoral membrane up and down when irritated, and had the further disagreeable habit under such circumstances of protruding its eyes until they seemed ready to fall out of their sockets. In Egypt Cestoni's Bat is one of those that frequent the Pyramids and other old buildings, which must make that country a perfect paradise for Bats.*

HEAD OF CESTONI'S BAT. (From the *Proceedings of the Zoological Society.*)

THE PALE CHESTNUT MASTIFF BAT.†

This widely-distributed species belongs to the typical sub-genus *Nyctinomus*, in which the characters of the genus are most clearly manifested, the upper lip especially being very strongly folded. Its total length is about four inches, an inch and a half of which is made up by the tail, about half of which is enclosed by the interfemoral membrane. The body is covered with a thick, short, soft fur, which scarcely encroaches upon the membranes, and is composed of hairs of a fawn colour at the tips, with the basal portion whitish or light ash colour; the fawn colour is paler on the lower surface of the body. The ears are of considerable size, rounded, closely approaching each other, but not joining on the top of the head, and furnished with a small tragus. The inner margin of the ear bears a row of five or six minute warts.

This species is found commonly in South America and the West Indies, and also extends northwards into the United States, at least as far as Charleston, in South Carolina. Mr. Osburn gives an excellent account of its habits, as observed by him in Jamaica, where this Bat is often very abundant in the houses. He says, "They generally appear from half-past five to six o'clock, directly after sundown, and occasionally appear up to ten o'clock, but not in such numbers. They again make their appearance in my bedroom before dawn. The beating of their wings, with the occasional squeaking call, is quite familiar to me as the first sound of morning." Its cry resembles the sound "click-click." In the shingled roof of the house at Rowington Park, Vere, Jamaica, these Bats were exceedingly abundant, passing the day clinging together in clusters, notwithstanding the heat experienced immediately beneath the shingles. Mr. Osburn says that he "counted fourteen little heads in a mass about the size of a turnip." Under these circumstances, however, they are not all asleep. "Now and then," says Mr. Osburn, "a wing is stretched in drowsy enjoyment; and the luxury King James thought too great for subjects, and ought to be reserved for kings, is largely indulged in by Bats. First one and then another wakes up, and withdrawing one leg, and leaving itself suspended by the other alone, adroitly uses the foot at liberty as a comb, with a rapid, effective movement dressing the hair of the

* *Nyctinomus tragatus* (Dobson), from Continental India, is a nearly allied species, as also *Nyctinomus plicatus*, an inhabitant of India, Sumatra, Java, and Borneo.

† *Nyctinomus brasiliensis.*

under part and head—an action far from ungraceful. The foot is then cleaned quickly with the teeth or tongue, and restored to its first use," of suspending the animal. A little after sundown, according to Mr. Osburn, the roof is alive with movement, betrayed by squeaks and a scuffling shuffle over the boards, and the Bats scramble eagerly up the shingles, and escape through any opening they may find, shooting off with great rapidity in search of their insect prey. In March they made their exit about half-past six o'clock in the evening, returning to their dwelling-place about eight or nine o'clock. "It is then," says Mr. Osburn, "they are so particularly annoying to the inhabitants of even the most carefully kept Jamaica houses. The great majority return to the roof; but one or two vigorous little fellows come into the room, and flap about in the most unmeaning way. Nothing is more remarkable than the agility with which a dozen, in the early part of the evening, skimmed and glided by every article of furniture. But now they bang themselves against the ceiling and walls, drop on the table, get up again, when the Cat, by jumping, catches them a pat, and they fall on the floor, not much hurt, to judge by their liveliness, for Grimalkin, having performed the feat, sits down, her paws tucked under, and gravely watches the hurry of the alarmed Bat shuffling over the floor. They disturb the harmony of the evening by becoming the occupants of, and making an escapade beneath, a gentleman's coat collar, or a great sensation by getting hopelessly entangled in a lady's hair, and bite more furiously than effectively during the process of release." These restless little fellows, which must at least add considerably to the liveliness of an evening *réunion* in those parts of Jamaica where they abound, remain very active in their quarters all night, and start out in search of their breakfast so early that they return home again by five or six o'clock. They then seem to amuse themselves, before retiring to their own repose, by breaking the slumbers of the people whose evening hours they have enlivened as above described, by flying about the bedrooms with a rushing sound and many squeaks. The species is exceedingly common in Jamaica, and seems always to inhabit houses. Mr. Gosse ("Naturalist in Jamaica," p. 159) also describes the habits of this Bat, which he calls the Chestnut Mastiff Bat.*

THE SMOKY MASTIFF BAT.†

In this abundant American Bat the fur is generally of a smoky-brown colour, with the bases of the hairs whitish; on the lower surface some of the hairs are entirely white, and the rest brown, with the base and apex whitish. The length of the head and body is from three and a half to four and a half inches, and that of the tail about two inches, nearly half of which projects beyond the membrane. The heel-spurs are very long. In this and the other species of *Molossus*, the intermaxillary bones are united, and the upper incisors close together in front.‡

The Smoky Mastiff Bat is a well-known South American species, and extends also into the West Indian islands. In Jamaica it was observed and described by Mr. Gosse under the name of the Monk Bat, in allusion to the fact that he found the species living in large communities, but always of one sex. Mr. Osburn also observed it in the same island, and has given a long account of its habits. In the house in which he was living at Shettlewood, these Bats swarmed in the roof, and during the breeding-season, his bedroom, situated immediately below, was rendered so offensive by their peculiar odour, that he was compelled to have every window left wide open at night. The Bats passed out from the roof under the eaves, but not unfrequently small parties of them would come in through the windows and take a short flight round the room. A man sent up into the roof brought down four or five quarts of the Bats, all of which proved to be males. These Bats also live in holes in dead stumps of cocoa-nut trees, and Mr. Osburn describes as follows the results of felling one of the stumps thus occupied. He says:—"It was broken into fragments by the fall, and among them a perfect hecatomb of these little Bats, scattered into two distinct heaps, corresponding to a high and a lower storey in the tree. There must have been at least 150 or 200 altogether. The heap which occupied the upper hole were exclusively males; those in the lower, females, in large proportion, though there seemed a male here and there among them." Mr. Osburn's observations thus strikingly confirm those of Mr. Gosse

* In a recent paper on the group Molossi, Mr. Dobson distinguishes in all twenty-one species of the genus *Nyctinomus*, mostly inhabitants of the Eastern hemisphere. Three species besides the one above described are found in America.

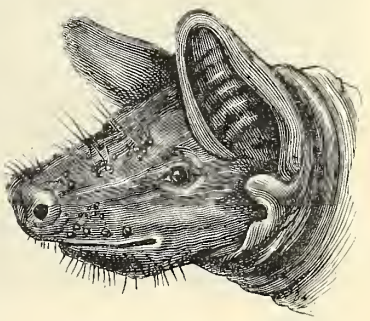
† *Molossus nasutus*.

‡ Mr. Dobson (*Proceedings of the Zoological Society*, 1876) describes nine species of *Molossus*, all from tropical America.

as to the curious habit of segregation on the part of the males of this species, which induced the latter gentleman to give it the name of the Monk Bat. The holes occupied by the Bats contained a great quantity of dust looking like coarse snuff, which proved to consist entirely of fragments of the hard parts of insects. Mr. Gosse appears not to have observed this Bat in houses, but he describes it as living in great numbers together in the hollows of decayed thatch-palms. He had brought to him a large basket containing a number of the Bats obtained from such a tree, and says that, on being uncovered, it "displayed a pretty scene of dusky life. The 'pie' of our infant days, that contained 'four-and-twenty blackbirds' all ready to sing, was nothing to it. Fifty Bats, all alive and kicking, were huddled into the narrow space; an arrangement which, considering their natural propensities, was probably not very disagreeable to them. I examined forty-three, a few escaping from the crowd, and if I was surprised before at the extent of their gregarious habits, I was still more surprised to find that of this number every one was of the male sex, as had been the one formerly examined. . . . . As they huddled and crawled over each other they emitted quivering squeaks. They all displayed the extraordinary activity mentioned above, preferring to run rather than fly, though a few took to wing. In climbing, to suspend themselves, they used the thumbs or the hind-feet indiscriminately. In running along the floor, an action which they performed very swiftly, they rested on the wrists, elevating the fore-parts of the body considerably."

THE COLLARED BAT.*

The Mastiff Bats certainly cannot boast of any great attractiveness in their aspect, but they must yield the palm of ugliness to a curious species described by Dr. Horsfield. It is a clumsy, heavy-looking animal, of considerable size for a Bat, measuring more than five inches in length from the tip of the nose to the root of the tail. Its body is entirely covered with a thick black skin, which is absolutely naked on the back, and only has a few short hairs upon the sides of the body, the interfemoral membrane, and the lower surface. The face and lips also have a few fine long hairs, and a curious collar of brown hairs runs round the neck. To add to the charms of the creature, the skin is thrown into thick folds in various parts of the body; the legs are thick, and terminated by clumsy feet, in which the first toe is very large, bristling with long hairs on the outside, and widely separated from the others, so as to acquire very much the character of a posterior thumb; the interfemoral membrane is short, forming a mere band between the legs, from which the tail, which is about half as long as the body, and very thick, projects for about two-thirds of its length. The head is long; the muzzle, which is truncated, projects considerably beyond the lower jaw; the ears are quite separate, triangular, with the tips rounded; the tragus is very small; the wings are long, and rather narrow, and their membrane extends down to about the middle of the shank, but springs from such a level on the sides of the body, that a deep cavity is formed on each side under the armpit, which is converted into a sort of pouch by an extension of the skin of the sides to the lower surface of the upper arm and thigh. In the pouches thus formed, and close to the armpits, the nipples are situated. There are two incisor teeth in each jaw, the upper ones strong, and implanted in well-developed and united intermaxillary bones. The upper jaw has one, and the lower jaw two premolars on each side, and there are three true molars on each side in both jaws.



HEAD OF COLLARED BAT.
(*After Temminck.*)

This hideous Bat was discovered in the peninsula of Malacca, and has since been found in Java, Sumatra, and Borneo. It does not appear to be abundant in its native countries, and its apparent rarity is doubtless increased by its selecting for its residence the wildest and most solitary districts in the heart of the great forests. During the day it usually retreats to the hollow trunks of trees, but sometimes takes its repose in holes in the ground or in clefts of the rocks, coming out soon after sundown, when it is seen flying heavily about the borders of the woods, or even high up above the forest in the plains.

* *Chiromeles torquatus.*

Another curious but by no means agreeable peculiarity of this species remains to be noticed. Across the base of the neck, immediately in front of the breast, there is a great pouch, formed apparently by a fold of the skin, which receives an oily secretion from a large gland, regarded by Professor Temminck as perhaps analogous to the thyroid. In the male this gland is very broad, and divided into two lobes, and the fluid secreted by it passes into the pouch by a great number of small pores. In the female the apparatus is smaller, but more complicated; the gland is composed of two small lobes, but between these there is a membranous pouch or reservoir, in which the oily fluid seems to become concentrated, forming a brown, granular, fatty matter, which passes into the great throat-pouch through a single large opening. This secretion possesses an odour so strong as to be still per-

THE COLLARED BAT. (*After Temminck.*)

ceptible after the animals have been preserved in spirits for several years; and Dr. Salomon Müller states that his artist, M. van Oort, when engaged in making a drawing from a living specimen, was affected with a headache and nausea so violent that he had much difficulty in completing his task. It appears that the fetid fluid gets diffused over the hairs bordering the throat-pouch, and thus readily passes off into the air, and spreads to a long distance round the places inhabited by the Bats, and may thus serve, as Professor Temminck suggests, to enable these creatures to find each other in the dark retreats which they frequent. This would apply to other species which diffuse a peculiar odour, although none of them seem to possess so powerful an odoriferous secretion as the Collared Bat.

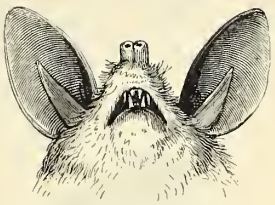
THE NEW ZEALAND SHORT-TAILED BAT.*

We have already noticed the occurrence in New Zealand of a species of Bat nearly allied to the common Bats of Europe, although differing from them in certain characters which have led to the

* *Mystacina tuberculata.*

formation of a distinct genus for it. The present species, the second known Bat of New Zealand, is a far more remarkable animal; in fact, its characters are so singular that it forms not only a distinct genus, but a peculiar sub-division of the family to which it belongs.

The Short-tailed Bat of New Zealand, which appears to be not of very common occurrence there, is a small Bat, not exceeding two inches and a half in length of head and body; the body is short and broad; the muzzle is greatly produced beyond the opening of the mouth, and terminates in a sort of projecting snout, which carries the nostrils towards the sides of its tip; the ears are quite separate, simple, ovate, and slightly pointed at the tips, and furnished with a long, narrow, and pointed tragus; the wings are rather short and broad, and the middle finger consists of four joints, having three true phalanges; the wing-membranes extend down to the end of the shank; a narrow band of the membrane running from the wrist down the arm, and bordering the side of the body and the leg, the antebrachial or shoulder membrane and the basal part of the interfemoral membrane are thick and leathery, and marked with numerous deep wrinkles on the upper surface. The tail is short, and only a very small portion of it is enclosed in the interfemoral membrane. The dentition is exceedingly peculiar. There are two upper incisors, which are nearly of the same shape as the canines; the lower jaw also has two incisors, but these are small, three-lobed at the tip, and placed in front of the canines, which are of large size, and nearly in contact at the base. There are two premolars and three true molars on each side in both jaws.

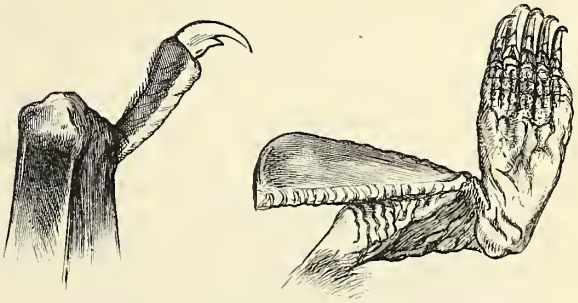


HEAD OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proceedings of the Zoological Society.*)

TEETH OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proc. Zool. Soc.*)

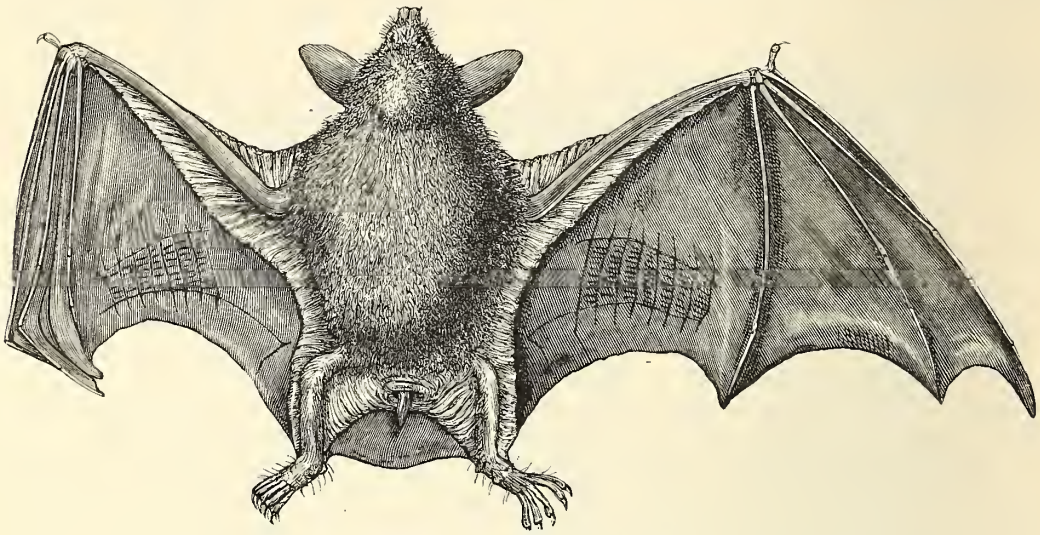
The fur is short, crisp, and thick, and extends forward on the head towards the nose, where it is bounded in front by a frill of stiff, upright hairs. On the upper parts of the body the fur is dusky at the base and tipped with a shining greyish-brown, with a slight olive tinge. On the lower surface the hairs are brown at the base, with greyish-brown tips. The membranes are dark-brown, with the wrinkled, leathery portion paler, and of a yellowish tinge. Of the habits of this species nothing has been recorded.

In many respects the New Zealand Short-tailed Bat is exceedingly interesting to the zoologist. In its structure it presents striking resemblances to species belonging to several groups, whilst its own personal peculiarities are very remarkable. These are noticed by Mr. Dobson, from whose valuable writings we have so often had occasion to quote, in a short paper read before the Zoological Society in 1876. He finds that the peculiar leathery and wrinkled portions of the membranes are so arranged that when the wings are folded—which they are in a very complicated manner, and so as to pack away into the smallest possible space—each wing is "tucked in beneath the thickened portion of the wing-membrane margining the fore-arm and side of the body, which sheaths and completely conceals the whole wing. The posterior half of the interfemoral membrane, from the point where the tail perforates it, is rolled upwards and forwards beneath the leathery anterior half." In this way the more membranous parts of the wings are protected, as Mr. Dobson remarks, precisely in the same way that the delicate wings of the Beetles and Bugs are sheltered in repose beneath the hardened elytra. "With the wings and interfemoral membranes thus encased," he adds, "this species is the most quadrupedal of Bats;" and the structure of the limbs indicates that all these arrangements really tend to adapt this animal for progression on all-fours. The thumb is long, and armed with a large, sharp claw, which is remarkable among Bats for having a small sharp tooth near the base, in its concave side, a structure which, from the analogy of a species of Chameleon in which the same thing occurs, is regarded by Mr. Dobson as greatly increasing the clinging power of



THUMB AND FOOT OF NEW ZEALAND SHORT-TAILED BAT.
(From the *Proceedings of the Zoological Society.*)

the animal. The hind limbs are short and stout, and the feet remarkably large, and their whole lower surface, including that of the toes, is covered with a soft, loose, deeply-wrinkled skin, that of each toe showing a strong central groove with short grooves at right-angles to it, very much after the pattern seen in some Geckos or Wall Lizards. This loose, wrinkled skin is also continued along the flattened lower surface of the ankle and leg. "All these peculiarities of structure," says Mr. Dobson, "must accompany some corresponding peculiarities in the habits of this species. . . . I have no doubt that the denticle at the base of the claw in *Mystacina tuberculata* compensates that species



THE NEW ZEALAND SHORT-TAILED BAT. (From the *Proceedings of the Zoological Society.*)

exceptionally for the imperfect condition of the fore-limbs as organs of prehension; and this, taken into consideration with the peculiar manner in which the wings are protected from injury when not employed in flying, and with the manifestly adhesive nature of the sole of the foot and inferior surface of the legs, leads me to believe that this species hunts for its insect food, not only in the air, but also on the branches and leaves of trees, among which its peculiarities of structure most probably enable it to walk about with security and ease." This and the Brown Pig Bat (*Thyroptera tricolor*), already described (p. 310), may be regarded as more especially adapted for climbing than any other members of the order Chiroptera.

CHAPTER VI.

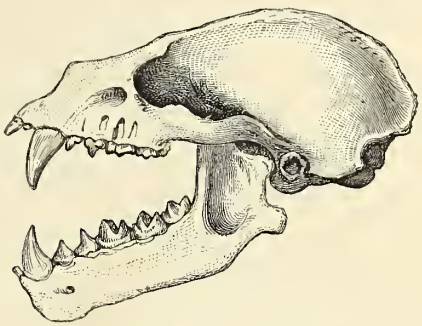
FAMILY VI.—PHYLLOSTOMIDÆ, OR VAMPIRES.

Distinguishing Marks of the *Phyllostomidæ* — Location — Diet — Blood-sucking Propensities — Exaggerations of the Older Writers—Testimony of Azara—Darwin's Evidence—Bat-bites—The Witness of Bates, Wallace, Fraser, Prince Maximilian—Conclusion of the Whole Matter—The Desmodonts and Javelin Bat—The Tongue in the Genus *Phyllostoma*—Blainville's Bat—Extraordinary Development of Face and Head—Owl-faced Bat—Javelin Bat—Allied Species—Vampire Bat—Mr. Bates' Testimony to its Inoffensiveness, and Description of its Habits—Neuwied's Large-leafed Bat—Great-eared Leaf Bat—Soricine Bat—Redman's Bat—Sezekorn's Leaf Bat—Spectacled Stenoderm—Jamaican Stenoderm—Desmodus—Dentition—Blood-sucking Propensities—The Bites—Stomachs of Desmodus—Frugivorous and Insectivorous Bats—Concluding Remarks.

We have already seen that the first group of ordinary Bats includes two sets of species, one characterised generally by the possession of dermal complications of the muzzle, the other by the absence of any such arrangements; and in like manner the second alliance has also its simple-nosed and

leaf-nosed forms. Of course, the presence or absence of the nose-leaf can only be regarded as a secondary character; and we have had occasion to show that its mere existence is not sufficient to overrule other important structural peculiarities (as in the genera *Nyctophilus* among the *Vespertilionidæ*, and *Rhinopoma* among the *Emballonuridæ*), but in conjunction with such characters it must be regarded as of great value, especially since its development would seem to be associated, as already pointed out, with that wonderful acuteness of the tactile sense which seems to guide the Bats in their nocturnal wanderings.

In the *Phyllostomidæ*, or Leaf-nosed Emballonurine Bats, this is strikingly the case, and the family may be regarded as an especially well-marked group, distinguished from all other Bats (except the genus *Mystacina*) by the presence of three distinct phalanges in the middle finger. Of these joints the first is short, and bent up in repose along the upper surface of the metacarpal bone, in the manner characteristic of the Bats of this division. The nasal appendages are sometimes rudimentary, but generally exhibit a structure more or less resembling that characteristic of the Horseshoe Bats, the nostrils opening in the fissure between the front-piece, or horseshoe, and true nose-leaf; and the chin is furnished with warts, or erect ridges of skin, reminding us of the same parts in the genus *Noctilio*, which certainly forms a sort of transition between the *Emballonuridæ* and *Phyllostomidæ*. Another character which seems at once to distinguish these Leaf-nosed Bats from those of the first division is the complete development of the intermaxillary bones, which in the *Rhinolophidæ* and *Nycteridæ* are rudimentary, or represented by mere cartilages. The dentition varies very considerably in this family, but in all the species the canines are large and acute, and the molar teeth show either the usual W-shaped cusps, or a sharp, cutting edge, like that found in some carnivorous mammals.



SKULL OF JAVELIN BAT.

The *Phyllostomidæ* are entirely confined to the warmer parts of America. Several of them are of considerable size. The food of some consists of insects; others find their nourishment in fruits; and a good many appear to have the habit of sucking the blood of other animals—an evil practice which has been erroneously ascribed to the species generally, causing them, under the name of Vampires, to be regarded as most formidable animals. As many of the accounts of the blood-sucking propensities of these Bats give no definite clue to the species referred to, and the number of species which seek this form of nourishment, habitually or occasionally, is very doubtful, it may be as well to give a general statement on the subject in this place.

The earliest accounts of the natural history of America contain references to these animals, with a probably somewhat exaggerated statement of the fatal effects of their attacks upon men and animals. Peter Martyr declares that the Bats suck the blood of men and animals while they are asleep, exhausting them to such an extent as to cause death. Piso, Father Jumilla, Don Antonio de Ulloa, and many other writers, express themselves in similar terms, and generally agree in representing the consequences of the bites as very serious.

La Condamine, who travelled in South America in the early part of the last century, confirms the above statements as to these Bats, which, he says, attack man, and even destroy animals. He ascertained that they suck the blood of Horses and Mules, and stated that they had in some places destroyed the cattle introduced by the missionaries.

Azara, in his natural history of the quadrupeds of Paraguay, describes the blood-sucking habits of a species which has been referred to the genus *Stenoderma*. He says:—"I have seen a great number; they were all constantly identical among themselves, but differ from all other Bats in that, when put on the ground, they run nearly as fast as a Rat, and they like to suck blood. Sometimes they bite the combs and wattles of sleeping fowls, and suck their blood, in consequence of which the fowls die, because the wounds mortify. They also bite Horses, Mules, Asses, and horned cattle, usually on the rump, the shoulders, or the neck, because in these parts they find it convenient to cling to the mane or

the tail. Lastly, man is not free from their attacks; and upon this point I can give certain testimony, seeing that they have bitten me four times in the tips of my great toes, when I was sleeping in the open country in huts. The wounds they made without my feeling them were circular or elliptical, from a line to a line and a half in diameter, but so shallow that they did not entirely penetrate my skin, and it could be seen that they were made by removing a small piece, and not by piercing, as might be supposed. Besides the blood which they sucked, I reckon that what flowed away might be half an ounce when I lost most by their attack; but as the effusion in the case of horses and cattle is about three ounces, and the skin of these animals is very thick, it is to be supposed that the wounds are larger and deeper. This blood comes neither from the veins nor from the arteries, seeing that the wound does not extend to them, but from the capillary vessels of the skin, from which the Bats, no doubt, draw it by sucking and licking. Although my wounds were painful for several days, they were of so little consequence that I did not apply any remedy to them."

These statements of Azara's reduce the affair to rather more moderate dimensions than would appear to belong to them from the exaggerated statements of the older writers, which can only be accepted with some allowance for the love of the marvellous inherent in those who have strange things to tell of new countries. But even these less extravagant accounts of the Vampires of South America were regarded in Europe with some feeling of scepticism; and Mr. Darwin appears to have been one of the first reliable naturalists to observe the act of blood-sucking on the part of a Bat of this family, belonging to the genus *Desmodus*. He says ("Journal," p. 25):—

"The Vampire Bat is often the cause of much trouble, by biting the Horses on their withers. The injury is generally not so much owing to the loss of blood, as to the inflammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one was actually caught on a Horse's back. We were bivouacking late one evening near Coquimbo, in Chili, when my servant, noticing that one of the Horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers, and secured the Vampire. In the morning, the spot where the bite had been inflicted was easily distinguished, from being slightly swollen and bloody. The third day afterwards we rode the Horse without any ill effects."

Tschudi, who travelled in Peru, and wrote on the natural history of that country, gives an account of his experience in the matter of Bat-bites. According to him, the blood which the Vampires draw from the wounds inflicted by them on cattle and horses is not more than an ounce or two, but the wound continues to bleed freely for some time; and it is not uncommon in the morning to find the animals attacked in a deplorable state, and bathed in their own blood. He mentions the case of an Indian who went to sleep when intoxicated, and was bitten in the face by a Vampire. The wound, which was small, and apparently of little consequence, was followed by an inflammation and swelling so great that the man's features became quite unrecognisable. In all probability, the condition of his blood after his debauch may have had a good deal to do with the severity of the after-effects of the wound.

Mr. Bates, who during his travels on the Amazon was once wounded in the hip, probably by a Bat, which he describes as a small dark-grey Phyllostome streaked with white down the back, states that it is only a few persons who are subject to be so attacked. His friend Mr. Wallace seems to have had a larger experience in this respect. He ascribes the mischievous propensity to the great Javelin Bat (*Phyllostoma hastatum*), of which he says:—

"This is a common Bat on the Amazon, and is, I believe, the one which does much injury to horses and cattle, by sucking their blood; it also attacks men, when it has opportunity. The species of blood-sucking Bats seem to be numerous in the interior. They do not inhabit houses, like many of the frugivorous Bats, but enter at dusk through any aperture they may find. They generally attack the tip of the toe, or sometimes any other part of the body that may be exposed. I have myself been twice bitten, once on the toe, and the other time on the tip of the nose; in neither case did I feel anything, but awoke after the operation was completed. In what way they effect it is still quite unknown. The wound is a small round hole, the bleeding of which it is very difficult to stop. It can hardly be a bite, as that would wake the sleeper; it seems most probable that it is either a succession of gentle scratches with the sharp edge of the teeth, gradually wearing away the skin, or a triturating with the

point of the tongue, till the same effect is produced. My brother was frequently bitten by them, and his opinion was that the Bat applied one of its long canine teeth to the part, and then flew round and round on that as a centre, till the tooth, acting as an awl, bored a small hole, the wings of the Bat serving, at the same time, to fan the patient into a deeper slumber. He several times awoke while the Bat was at work, and though of course the creature immediately flew away, it was his impression that the operation was conducted in the manner above described. Many persons are particularly annoyed by Bats, while others are free from their attacks. An old mulatto at Guia, on the Upper Rio Negro, was bitten almost every night, and though there were frequently half a dozen other persons in the room, he would be the party favoured by their attentions. Once he came to us with a doleful countenance, telling us he thought the Bats meant to eat him up quite, for having covered up his hands and feet in a blanket, they had descended beneath his hammock of open network, and attacking the most prominent part of his person, had bitten him through a hole in his trousers! We could not help laughing at the catastrophe, but to him it was no laughing matter.

"Senhor Brãndão, of Manaquery, informed me that he had once an Indian girl in his house, who was much subject to the attacks of the Bats. She was at length so much weakened by the loss of blood that fears were entertained of her life, if they continued their attacks, and it was found necessary to send her to a distance, where these bloodthirsty animals did not abound.

"The wound made by them is very difficult to heal, especially in its usual locality—the tip of the great toe—as it generally renders a shoe unbearable for a day or two, and forces me to the conclusion that, after the first time, for the curiosity of the thing, to be bitten by a Bat is very disagreeable. They will, however, very rarely enter a lighted room, and for this reason the practice of burning a lamp all night is almost universal."

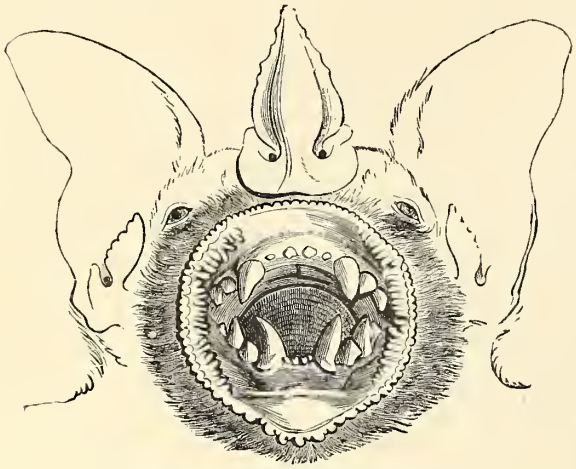
In the island of Muciana, situated in the mouth of the Amazon River, Mr. Wallace had an opportunity of observing the mischief done by these blood-sucking Bats on a large scale. The island is used as a grazing-ground, but some of the horses and cattle on it, says Mr. Wallace, were "miserable-looking objects, from wounds inflicted by the Bats, which cause them to lose much blood, and sometimes, by successive attacks, kill them. Senhor Leonardo informed us that they particularly abounded in some parts of the island, and that he often has Bat-hunts, when several thousands are killed." Mr. Wallace describes the criminal in this locality as a large coffee-brown Bat, probably the *Phyllostoma hastatum*. He adds that they "live in holes of trees, where they are killed in considerable numbers, Senhor Leonardo informing me that they had destroyed about seven thousand during the last six months. Many hundreds of cattle are said to have been killed by them in a few years."

Mr. Louis Fraser, when collecting at Gualaguzia, in Ecuador, obtained a specimen of the Javelin Bat, and was told by the Indian who brought it to him that this species attacks the Mules.

Prince Maximilian of Neuwied also lays the crime of blood-sucking at the door of the Javelin Bat. He says:—"In its stomach I found remains of different kinds of insects, but never any traces of blood that had been swallowed; nevertheless, it is certain that this and many other species of Phyllostomes suck the blood of animals. I have never surprised such a Bat at the moment of sucking, but have observed in the moonshine and twilight how these large animals fluttered, with strongly rustling wings, about our grazing beasts of burthen, which bore their vicinity quietly, but on the following morning were covered with blood, from the shoulders down to the hoofs. On the Rio das Contas we found the cattle quite exhausted with the loss of blood." The same author adds:—"As I have never found blood in the stomachs of the Phyllostomes, this nutriment can only be partaken of by them rarely, and for this reason I do not venture to decide whether some, or all, or what species of them are fond of this food; but with regard to the *largest* species here described, it needs no further confirmation, and I believe that of all the Phyllostomes described by me, it is nearly the only one that sucks blood."

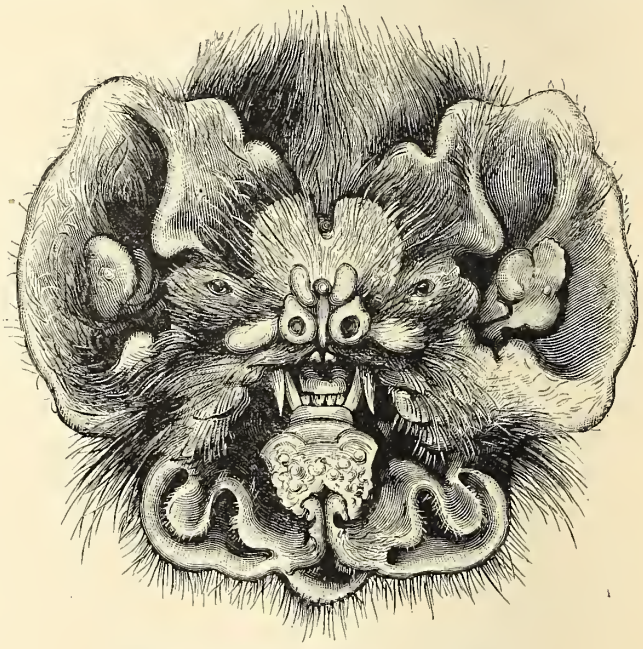
It will be seen from the foregoing statements that there is some uncertainty as to the precise species which may justly be charged with the crime of blood-sucking. The habit has been ascribed to various species, some of which are now known to feed upon fruits, whilst others find their nourishment in the abundant insect population of tropical America; and in the opinion of many zoologists of the present day, the sole criminals are the species of the genus *Desmodus*, a small aberrant group, specially distinguished from all the rest by the structure of their teeth and stomach. Mr. Tomes, in commenting

on Mr. Fraser's statement, suggests that the blood-sucking was performed by the Desmodonts, which accompanied the Javelin Bat in Mr. Fraser's collection, and the guilt transferred to the larger and more striking species; and the same explanation may apply to the accounts given by Mr. Wallace and Prince Maximilian, both of whom apparently charge the Javelin Bat with sanguinivorous proclivities solely upon circumstantial evidence. If this be the case, *Phyllostoma hastatum* must be regarded as a very unfortunate animal. Professor Reinhardt agrees with Mr. Tomes in considering the Desmodonts (*Desmodus* and *Diphylla*) the only blood-sucking Bats, and they appear to be the only forms that have been actually taken in the fact.



MOUTH OF SPECTACLED STENODERM.

At the same time we are perhaps hardly justified in passing a verdict of not guilty in the case of some of the other species, for certain observers record the finding of blood in the stomach, and by others the structure of the mouth is looked upon as furnishing circumstantial evidence of sanguinary propensities. Thus Professor Bell says that the tongue in the genus *Phyllostoma* has a number of wart-like elevations, so arranged as to form a complete circular suctorial disc when they are brought into contact at their sides, which is effected by a set of muscular fibres having a tendon attached to each of the warts. By means of this curious sucker, he adds, these Bats are enabled to suck the blood of animals and the juice of succulent fruits. According to other writers the papillæ which are borne by the lips (see figure), and which seem to have some analogy with the wrinkles occurring on the lips of the Mastiff Bats, serve this same office; and Prince Maximilian especially describes the mode in which the lips in the Javelin Bat may be converted into a sucking-canal. It is to be observed, however, that these papillæ are greatly developed in species which are now known to derive the whole or the greater part of their nourishment from fruits.



HEAD OF BLAINVILLE'S BAT. (*After Peters.*)

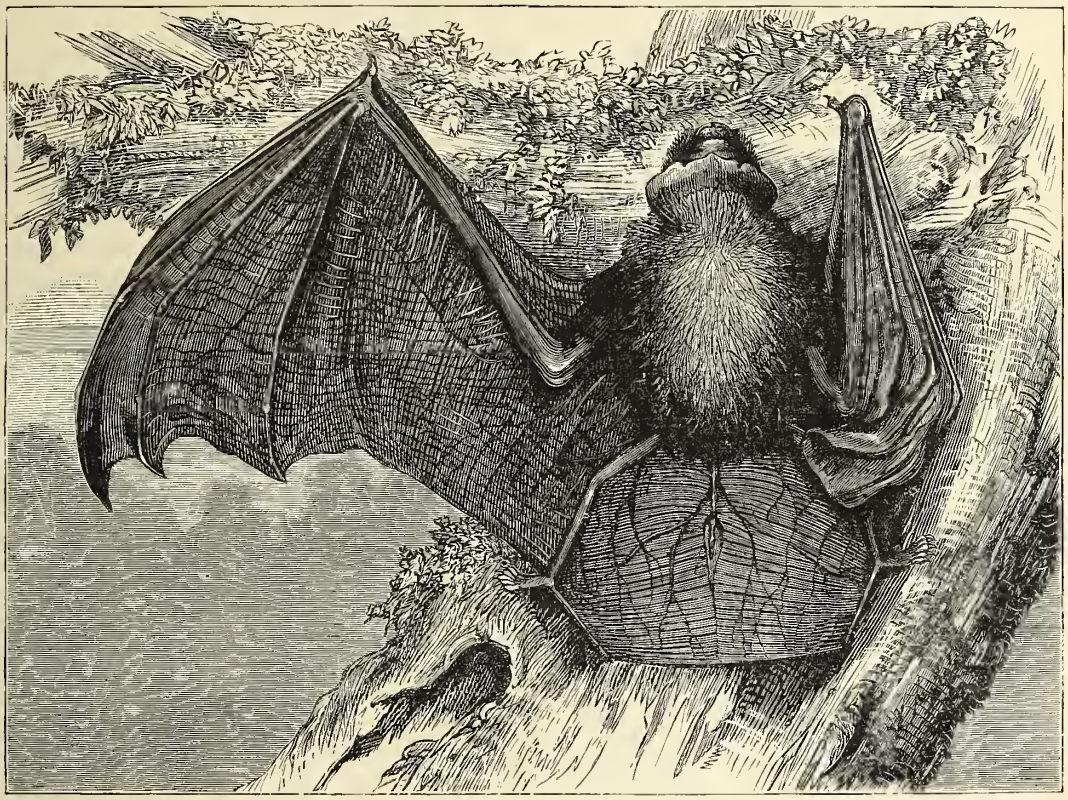
BLAINVILLE'S BAT.

A most grotesque species of Bat, the position of which has been a subject of some discussion, as it seems to be almost equally related to the *Emballonuridæ* on the one hand, and to the *Phyllostomidæ* on the other, was described many years ago (in 1821) by the late Dr. Leach under the name of *Mormops Blainvillii*. As regards the development of the cutaneous system about the face, this species is without exception the

* *Mormops Blainvillii.*

most extraordinary species of the whole order (see figure). The skull itself is of curious structure, the cranial portion, or that containing the brain, being so much elevated, that its height is nearly equal to the whole length of the skull, and its front wall descends in such a manner as to form nearly a right angle with the bones of the face (see figure). The superficial structures belonging to the face and head are so complicated as almost to defy description, and so grotesque that one might recommend their study to the inventors of demon-masks for pantomimic purposes. The ears are of considerable size, and have their margins notched in several places; they sweep round on the cheek, to terminate at a short distance from the angle of the mouth, and have their inner margins joined by a fold of membrane. The tragus is a thick, more or less lobulated organ. The nostrils are round apertures in the extremity of the snout;

SKULL (*Natural Size*) AND DENTITION (*Enlarged*) OF BLAINVILLE'S BAT.



BLAINVILLE'S BAT. (*About Four-fifths Natural Size. After Peters.*)

their margins are raised and naked, and produced above into small lobes. Between the nostrils there is a perpendicular ridge, and above this a small round papilla, on each side of which there is an irregularly kidney-shaped elevation. Behind these parts comes a large fold of skin, deeply notched in the middle above, which joins on each side with the middle of the membrane uniting the ears, and probably represents the hinder nose-leaf in some other Bats. The lower lip consists of two leaves, the upper of which forms in the chin a large shield-shaped, warty plate, beneath which the lower leaf and the skin of the throat form a complicated series of lobes.

The teeth in this Bat consist of four incisors and a pair of strong canines in each jaw, two premolars in the upper and three in the lower jaw, and three molars, with more or less distinct W-shaped cusps on each side in both jaws (dental formula—incisors, $\frac{4}{4}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{2-2}{3-3}$, molars, $\frac{3-3}{3-3}$). The wings are well developed, long, and broad, and the membranes descend to the

ankles (see figure); the first phalanx of the middle finger is very short. The interfemoral membrane is ample, and stretched by two very long heel-spurs; it is perforated before the middle for the passage of the tail, about one-third of which projects on the upper surface of the membrane.

The length of the head and body in this species is about two inches and two-thirds, and that of the tail from one inch to one inch and one-sixth, according to the sex, being longer in the male. The fur of the upper side is of a rich umber-brown, and that of the lower surface brownish-grey, the difference being caused by the brown tips of the hairs above, which are wanting on those of the under side. The hairs on the inner margin of the ear are shiny brown. The membranes are dark-brown. This species is an inhabitant of South America and of the West Indies, but it does not seem to be very abundant. Nothing has been recorded as to its habits, but it is probably a strictly nocturnal Bat.

Blainville's Bat is the type of a small group of *Phyllostomidæ*, which, as already indicated, form a sort of transition towards the more normal *Emballonuridæ*, the line of relationship probably passing through the *Noctiliones*. This group (*Mormopes*, Peters; *Lobostominæ*, Dobson) is characterised by its terminal nostrils, and the cutaneous folds or ridges on the chin.

THE OWL-FACED BAT.*

This is another species of the *Mormops* group, but very much less remarkable in its characters. It has pointed ears, with an elongated tragus. The hinder nasal appendage, which is so large in Blainville's Bat, here forms merely a sort of transverse pad across the middle of the muzzle, and the nostrils are pierced in the middle of the upper part of a naked piece, which rises directly from the upper lip. The lower lip is warty, but the warty portion gradually passes into the other part of the lip, and below it there is a thin fold of skin. The skull is considerably longer than high; and while the teeth are present in the same number as in *Mormops*, the second premolar in the lower jaw is small, and removed inwards from the line of the series of teeth.

HEAD OF OWL-FACED BAT.
(From *Gosse's "Jamaica."*)

The Owl-faced Bat is a small species, the head and body measuring only two inches. The tail is an inch long, and about a fifth of it projects from the upper surface of the interfemoral membrane, which is expanded by a pair of very long spurs. The expanse of wing is nearly twelve inches, which is very great for so small a Bat. The body is covered with a short, soft fur, of a brownish-grey colour above, and pale-grey beneath; the membranes are black.

The Owl-faced Bat was originally obtained from Cuba, but it has since been captured in St. Domingo and Jamaica, and may probably occur elsewhere in the West Indies, or on the continental part of Central America. Mr. Gosse, when in Jamaica, captured a specimen which flew in at an open window, but did not allow itself to be taken until after a very tedious pursuit, in which it manifested great agility on the wing. He says that "in captivity it uttered once or twice, very slightly, the peculiar short sound resembling the *clicking* of some delicate piece of machinery, which every one who is familiar with living Bats will remember as common to most of these animals. It was very active, leaping up to flight from the table, and expanding the wings in a moment, though confined within a candle-shade. It bit fiercely at the hand that held it, but could not draw blood from the fingers. It usually carried the apical half of the interfemoral bent upward at the point where it ceases to embrace the tail, so that the tail seems to extend beyond the membrane. It is thus held by the calcanea, the tips of which, curving downward, carry down again the tip of the membrane, puckered into minute plicæ."

Another species of this genus, *Chilonycteris Parnellii*, inhabits Cuba and Jamaica, and two others, *C. personata* and *C. rubiginosa*, occur in Brazil, and extend thence to Central America.

Another allied form is Davy's Bat (*Pteronotus Davyii*), which is remarkable for having the wings attached along the course of the spine, as in the Pteropid genera *Cephalotes* and *Notopteris* (see pp. 277, 278).

* *Chilonycteris Macleayii.*

THE JAVELIN BAT. *

In the genus *Phyllostoma* the nasal appendages are well developed; there is a distinct horseshoe-shaped piece in front, and above the nostrils rises a large lance-shaped leaf. The middle of the lower lip shows a triangular naked patch with warty margins. The ears are of moderate length and quite separate; the tail is much shorter than the interfemoral membrane; and the first phalanx of the middle finger is less than half the length of the metacarpal bone. There are, as usual in this family, four incisors in each jaw; the canines are large and powerful, and the lower jaw has only two premolars on each side. The true molars are well developed, and show strong W-shaped cusps.

HEAD OF JAVELIN BAT.

The Javelin Bat, which lives in all parts of tropical America, and also occurs in the West Indies, is a large species, measuring more than five inches in total length, and nearly twenty-three inches in expanse of wing. Its fur is usually of a uniform brown colour; its ears of moderate size, somewhat pointed, strongly excavated on the outside below the apex, and with a lance-shaped tragus; the short tail extends about one-third of the length of the interfemoral membrane, which is stretched straight across between the long heel-spurs.

We have already referred at some length to the habits of this species in connection with the charge of blood-sucking that has been brought against it, and stated that when examined only remains of insects are found in its stomach. It is described as having a lofty and powerful, although not rapid flight. These Bats frequently make their way into rooms through the open windows, when they fly about rather noisily. In the neighbourhood of houses they sleep during the day among the leaf-stalks of the cocoa-nut palms; in the open country they resort to the hollow trunks of trees.

Numerous species nearly allied to this occur in Brazil and other parts of America, such as *Phyllostoma discolor* and *elongatum*, *Mimon Bennettii* and *megalotis*, in which the chin bears two warts separated by a furrow; *Tylostoma Childreni* and *crenulatum*, with only two lower incisors; *Carollia brevicauda*, in which the middle of the horseshoe is scarcely distinct from the upper lip; *Rhinophylla pumilio*, in which the tail is entirely wanting; and *Phylloderma stenops* with three instead of two premolars on each side in the lower jaw.

HEAD OF VAMPIRE BAT.

THE VAMPIRE BAT.

The genus *Vampyrus* differs from *Phyllostoma* and its allies (except the last) by the presence of three premolars on each side in the lower jaw. The lower lip has two broad warts separated by a furrow; the ears are large and separate; the first joint of the middle finger is more than half as long as the metacarpal bone; and the tail is altogether wanting. The nasal appendage has the horseshoe part well developed, with the margin free and quite distinct from the upper lip.

The Vampire, which was one of the earliest known species of these American Bats, and is also the largest of all, is by no means an amiable-looking animal. Its head is considerably elongated; the nose-leaf is long and pointed; the wings reach the base of the outer toe, and the middle of the hinder margin of the interfemoral membrane projects in a little point, although, as already stated, there is no tail to cause any such projection. The fur, which is long and soft, is usually chestnut-brown above and pale beneath. The length of the head and body in this Bat is about five and a half inches. From

* *Phyllostoma hastatum.* † *Vampyrus spectrum.*

various considerations, no doubt in part from its large size and ugliness, this Bat has always been regarded as one of the most noxious of the blood-suckers of its family, and, in fact, it owes its name of Vampire to the belief in its sanguinary nature. But Mr. Bates, who certainly had good opportunities of observing it, acquits the Vampire of this charge. In describing his residence at Ega, on the Upper Amazon, he says :—"The Vampire was here by far the most abundant of the family of Leaf-nosed Bats. It is the largest of all the South American species, measuring twenty-eight inches in expanse of wing. Nothing in animal physiognomy can be more hideous than the countenance of this creature when viewed from the front; the large leathery ears standing out from the sides and top of the head, the erect spear-shaped appendage on the tip of the nose, the grin, and the glistening black eye, all combining to make up a figure that reminds one of some mocking imp of fable. No wonder that imaginative people have inferred diabolical instincts on the part of so ugly an animal. The Vampire, however, is the most harmless of all Bats, and its inoffensive character is well known to residents on the banks of the Amazons. I found two distinct species of it, one having the fur of a blackish colour, the other of a ruddy hue, and ascertained that both feed chiefly on fruits. The church at Ega was the head-quarters of both kinds. I used to see them, as I sat at my door during the short evening twilight, trooping forth by scores from a large open window at the back of the altar, twittering cheerfully as they sped off to the borders of the forest. They sometimes enter houses. The first time I saw one in my chamber, wheeling heavily round and round, I mistook it for a Pigeon, thinking that a tame one had escaped from the premises of one of my neighbours. I opened the stomachs of several of these Bats, and found them to contain a mass of pulp and seeds of fruits, mingled with a few remains of insects. The natives say they devour ripe cajús and guavas on trees in the gardens; but, on comparing the seeds taken from their stomachs with those of all cultivated trees at Ega, I found they were unlike any of them; it is therefore probable that they generally resort to the forest to feed, coming to the village in the morning to sleep, because they find it more secure from animals of prey than their natural abodes in the woods."

The two forms referred to by Mr. Bates in the above extract were probably only colour varieties of *Vampyrus spectrum*, but several nearly related species occur in tropical America. Thus, *Chrotopterus auritus* differs from the preceding only in having a short tail like that of *Phyllostoma*, and the second lower premolar small, and placed within the line of the teeth; *Lophostoma sylvicola*, *amblyotis*, and *bidens*, all from Brazil, have the second lower premolar small, but in the row, the horseshoe only developed at the sides, the lower lip as in *Phyllostoma*, the first phalanx of the middle finger a little shorter than the metacarpal, and only two incisors in the lower jaw; *Schizostoma minutum*, *elongatum*, and *Behnii*, whilst agreeing with *Lophostoma* in the proportion of the first phalanx of the middle finger, have the horseshoe and lower lip as in *Vampyrus;* and *Trachyops cirrhosus* has the lower margin of the horseshoe indistinct, the lower lip with a double row of warts and a deep furrow, and the second lower premolar very small, and placed within the line of the row of teeth. These Bats are all inhabitants of the tropical parts of America.

Neuwied's Large-leafed Bat (*Macrophyllum Neuwiedii*) is one of the few species of the present family in which the tail is respectably developed. The ears are of moderate size and separate; the horseshoe is well developed, and the nose-leaf very long, lance-shaped, and pointed. The dentition is as in *Phyllostoma*. This is a small Bat, measuring only about three inches and one-sixth in total length, of which the tail occupies one inch and one-third. The fur is of a sooty-brown colour, paler beneath; the nose-leaf is darker, and the membranes lighter in colour than the body; the interfemoral membrane has about half a dozen curved lines of small dark points towards its apex. Neuwied's Bat was discovered by Prince Maximilian in Brazil in the forests of the banks of the Moucouri River. He describes it as not very abundant, and as passing the day clinging to rocks and the trunks of trees. Its stomach contained remains of insects.

The Large-eared Spear-nosed Bat (*Lonchorhina aurita*), an allied species with a long tail and a very long nose-leaf, is a native of the West Indies. The tail traverses the interfemoral membrane in the fashion of that of a Vespertilionid Bat. The nose-leaf has a distinct rib running up its middle, and at its base there is a deep pit divided into two by a partition on each side of which are the nostrils, and the place of the horseshoe is taken by a curious three-leaved process which stands out in front of the nostrils.

THE GREAT-EARED LEAF BAT.*

The Great-eared Leaf Bat, an inhabitant of St. Domingo and Jamaica, is the type of a remarkable little genus, characterised by having the ears very large, membranous, and united at the base by a membrane; the nasal appendage erect; the interfemoral membrane large, cut out behind in a broad curve running from the tip of one spur to the other; and the tail long, projecting by its last joint beyond the interfemoral membrane. The head is rather long, and the jaws armed with four incisors in each—the intermediate ones in the upper jaw being larger than the lateral—two premolars in the upper, and three in the lower jaw, and three true molars in each jaw. The species of this genus occur in the West Indies, Mexico, and California.

The Great-eared Leaf Bat (*Macrotus Waterhousii*) is a small species, the head and body measuring two inches and a half in length, and the tail one inch and one-sixth. Its fur is of a mouse-colour, paler beneath, and the nose-leaf is lance-shaped.

Our knowledge of the habits of this Bat is chiefly derived from observations made in Jamaica by Mr. Gosse and Mr. Osburn. The former says that it is one of the commonest of the Jamaica Chiroptera, and that it is more addicted than any other species to visiting lighted rooms at night. Mr. Osburn obtained it in abundance from caves; and he adds that although it occurs in houses, it there always inhabits the cellars, and is never found in roofs. The great breadth of the wings gives it during flight an appearance of being larger than it really is, and its flight, according to Mr. Gosse, is not so noiseless as in Bats generally, but accompanied by an audible rushing sound. When on the ground, it makes no attempt to crawl, but springs at once into the air, and takes flight as readily as a bird. Mr. Osburn obtained many females with their young, and describes the mode in which the latter adhere to their mothers. He says the nipple was held by the little hooked teeth of the young animal, while the fur, or even the thigh of the opposite side, was grasped by its feet, so that the young Bat lay diagonally across its mother's belly. The food of the Great-eared Leaf Bat consists for the most part of insects. Mr. Osburn found in the stomach of one a yellowish mass, with fragments of the hard parts of insects, among which were two short legs with strong claws, which probably belonged to some species of Orthoptera.

From one observation it would appear that this Bat is supposed sometimes to feed on fruits. Mr. Osburn says that at Mount Pleasant, St. Ann's, his attention was called to a number of spirts on the wall in an open verandah, on examining which he says he detected seeds of the fustic berry sticking to the wall. He was informed that they were produced by these Bats, which came in at night, and hitched themselves up, when a chewing might be distinctly heard, and then these splashes on the wall. One let the legs and wings of a large Grasshopper drop. The berries said to be particularly affected by these Bats were those of the fustic (*Morus tinctoria*), the bread-nut (*Brosimum alicastrum*), and the rose-apple (*Eugenia jambos*), all of which are mentioned by Mr. Osburn as favourite articles of food with *Stenoderma perspicillatum*, a true fruit-eating Bat.†

THE SORICINE BAT.‡

HEAD OF SORICINE BAT.

Agreeing with the Phyllostomes and Vampires in the form of the molar teeth, the general form of the muzzle, the presence of a nose-leaf and tragus, and some other characters, the *Glossophagæ* exhibit some striking peculiarities which serve to distinguish them from these and all other Bats. Foremost among these is the structure of the tongue, which is very singular. It is a long, somewhat compressed fleshy cylinder, beset with reversed hairs, and capable of being pushed out of the mouth to a considerable distance. In the fresh state, according to Rengger, it has a furrow running along the upper surface, and this, he thought, rendered it specially applicable to the purpose of sucking blood, which was formerly supposed

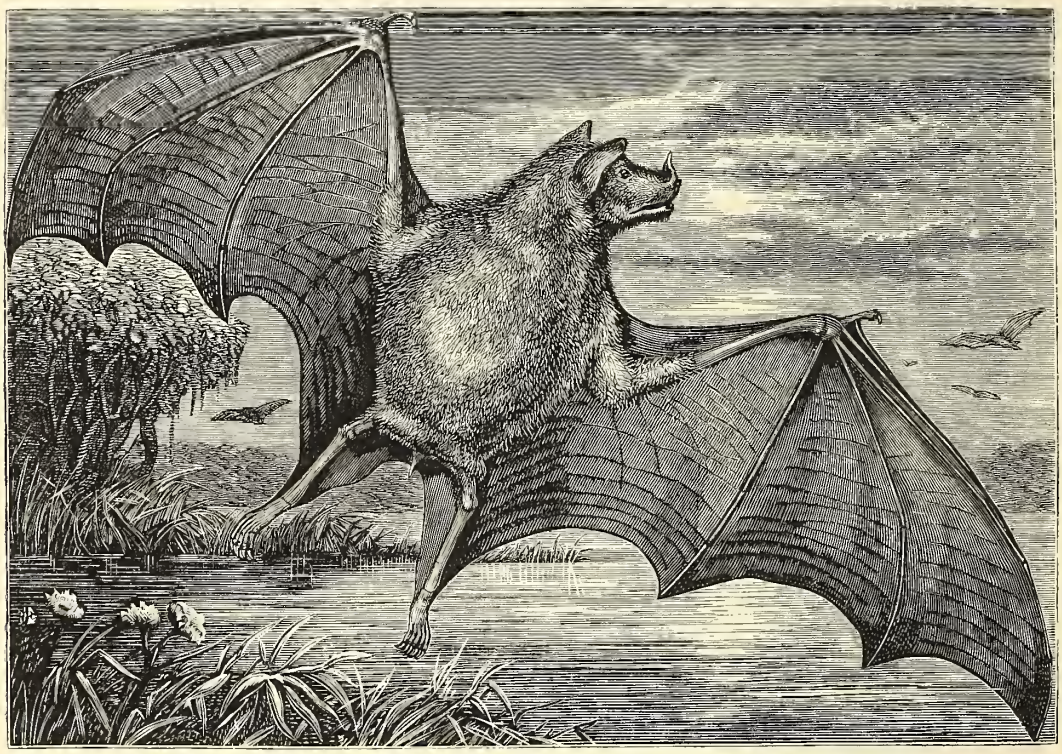
* *Macrotus Waterhousii.*

† Other known species are *Macrotus californicus* and *M. mexicanus*, the native countries of which are indicated in their specific names.

‡ *Glossophaga soricina.*

to be a habit of all these Bats. The lower lip is cleft, and the margins of the fissure furnished with warts, a construction which also contributed to raise a suspicion of the sanguinary habits of the animals. The horseshoe-shaped part of the nose-leaf is very imperfectly developed, and the organ consists chiefly of the lance-shaped leaf; there are four incisor teeth in a close row in each jaw, the two middle ones in the upper jaw larger and broader than the others; the upper jaw has two and the lower three premolars on each side, and there are three true molars on each side in both jaws.

The Soricine Bat has received a great number of names; at least, numerous supposed species founded upon slight differences of colour, &c., are regarded by Professor Peters as all referable to the species described by Pallas, in 1766, under the name of *Vespertilio soricinus*. It is a small Bat about two inches and a quarter long including the tail, which measures about one-sixth of a inch, and is



REDMAN'S BAT. (*Three-fourths Natural Size.* From the *Proceedings of the Zoological Society.*)

enclosed within the interfemoral membrane. The ears are of moderate size and separate, with small, pointed tragi; and the body is clothed with a rather long, soft, and thick fur, usually of a rusty greyish-brown colour, paler on the lower surface. This Bat inhabits the whole of the warmer part of South America, extending from the Brazilian coast to the Andes, and northwards into Venezuela and Guatemala. It is said to feed chiefly on insects, but probably, like the following species, diversifies its food by eating succulent fruits, this being apparently the purpose for which these animals are endowed with their peculiar tongue.

REDMAN'S BAT.*

The genus *Monophyllus* is nearly allied to *Glossophaga*, but has the incisor teeth in pairs, and the lower ones exceedingly small. The interfemoral membrane forms a narrow border running up the legs, and crossing from side to side; and the tail, although short, projects beyond the membrane. The teeth are—incisors, $\frac{2-2}{2-2}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{2-2}{3-3}$, molars, $\frac{3-3}{3-3}$. The only known species is

* *Monophyllus Redmanii.*

Redman's Bat (*Monophyllus Redmanii*), in which the head and body measure about two inches and one-sixth in length. The expanse of wing is about twelve inches; the fur, which is thick, soft, and glossy, is greyish-brown above with the tips of the hairs slightly hoary, and dusky grey tipped with greyish-white on the lower surface. The membranes are dark brown. This species occurs in Jamaica and Cuba.

It was found by Mr. Osburn at Cairo, in Jamaica. He describes it as exceedingly fierce, drawing blood readily from the back of the hand of its captor. Its activity was beyond anything he had seen in Chiroptera. It ran round the box in which it was placed by a series of little jumps, with almost the quickness of a Mouse, and jumped with the agility of a bird. "On placing it under a glass," he says, "after its first efforts had a little subsided, I saw its tongue projected very rapidly to the board. It seemed to me to be using an additional sense to ascertain the nature of the unusual substance on which it was resting. It frequently stretched its neck and head upwards, the nose-leaf and round ears in motion, as if trying to ascertain whether there was an aperture above, its bright little eyes piercing with eagerness, and panting like a Mouse." Mr. Osburn's observations on the specimens which he had in captivity seem to lead to the conclusion that this Bat feeds on soft fruits, and that its long and peculiar tongue is employed in sucking up their pulp.

Ischnoglossa nivalis has the incisors in pairs and no tail. The described specimen was obtained near the snow line on the Pic d'Orizaba, in Mexico.

SEZEKORN'S LEAF BAT.*

The genus to which this Bat belongs is distinguished from all the preceding ones in the group of *Glossophagæ* by the absence or imperfection of the zygomatic arch in the skull. In its dentition it resembles *Glossophagæ*. The interfemoral membrane is merely a narrow border round the legs, and the calcaneal spurs are very short, or altogether wanting. There is a very short tail, which, however, projects beyond the interfemoral membrane; the nose-leaf is extremely short, or, indeed, almost rudimentary; and the tongue is very long, pointed, and armed at the sides towards the tip with acute spines turned backwards. This species was discovered in Cuba; it occurs also in Jamaica.†

In the latter island Mr. Osburn found it inhabiting a cave in immense numbers, flying about and swarming on the roof and walls like Bees in a hive. The floor of the cavern was covered with bread-nut kernels and munched berries of the clammy cherry (*Cordia collocasia*). The Bat chirps and squeaks like a bird.

Mr. Osburn describes its manners in confinement as follows:—At first the Bats were restless and fierce, biting violently. When exhausted and quiet he gave them water, which "they drank eagerly, protruding the tongue—the lip hollowed spoon-shape, and the bristles evidently taking up a great quantity." The fruit of the clammy cherry being offered to them, they took no notice of it until Mr. Osburn thought of breaking the skin, when the one he presented it to at last seemed to understand the position of affairs, and licked at it vigorously. "The tongue," says Mr. Osburn, "was rapidly protruded and drawn in again, and the juice and softer pulp cleared away with great rapidity. I noticed that he was very particular in cleaning out the bit of loose skin of the berry, and licked my fingers of the juice spilt on them, carefully cleaning out any that had collected under the nail. The sensation was not at all unpleasant, the tongue feeling soft and spongy, with a slight scratching from the bristles. I then got another berry. The Bat was hanging from the edge of the box, its ventral surface against the side; and as I held the berry a little off, so as to see the action of the tongue, it had, whilst feeding, to bend the neck, so as to raise the head a little. This seemed to fatigue it. It therefore raised itself on one wrist, and turned round, so that its back was against the box's side; but as it did not change the position of the feet, of course the legs crossed. . . . . In this odd position it seemed perfectly at ease, and went on licking at a fresh berry with great relish. . . . . It seized it with its teeth savagely, and then shifted it to one side of the mouth, so that the long sharp canines of one side and the blunt molars held the berry. . . . . This left room for the tongue still to be protruded; for from the arrangement of the minute lower incisors in a concave, the molars can be nearly closed, so as to

* *Phyllonycteris Sezekornii.* † Poey's Leaf Bat (*Phyllonycteris Poeyi*) is a second species inhabiting Cuba.

hold an object, and the tongue still have room for protrusion. The little body trembled with the eagerness of his actions. As the pulp and juice it could thus reach became exhausted, I expected it would drop it; but, to my surprise, it brought up the wrists to the muzzle, took the berry between them, gave it two or three energetic bites, and then held the berry off. So I now understood what the long thumbs were for; for they applied themselves dexterously to the berry, held it firmly, and then, as it appeared to me, by a reverse action of the two wrists, the berry was turned round, a fresh hold taken by the teeth, and the same licking process renewed, till the seed in the centre was cleaned of the pulp, all but the little bit which served for the last tooth-hold. It was then dropped, and the eager little muzzle raised for more. I supplied another, and soon I had a little heap of seeds, exactly like those I found in the cave." This account is particularly interesting, and gives us a clear idea of the proceedings of these curious Bats. Mr. Osburn remarks that the Bats when holding the berries greatly reminded him of Monkeys, and on placing them among the twigs of the cherry, their climbing habits seem to have increased the resemblance.*

THE SPECTACLED STENODERM.†

A peculiar group of this family is formed by the genus *Stenoderma* and its allies. In these Bats the muzzle is short, and the molar teeth do not show the W-like pattern characteristic of the preceding forms, but generally have some sharp points and a cutting edge on the outside. The tail, when present, is very short, and the interfemoral membrane is deeply cut out behind, so much so in many cases as to form a mere narrow border to the legs. The nasal appendages consist of a lance-shaped leaf springing from the middle of a regular horseshoe; and the ears are separate, and furnished with a tragus. The Stenoderms have been divided by authors into several genera, but the characters upon which these are founded are for the most part so minute and uncertain that it would be a mere waste of time to attempt to give them here.

The Spectacled Stenoderm (see p. 264) is one of the best-known species of this group, and inhabits the larger islands of the West Indies, such as Cuba, St. Domingo, and Jamaica, as well as the continental regions of Guiana and Brazil. It is a large species, measuring from four inches to four inches and a half in length, and from sixteen inches to twenty inches in expanse of wing. Its fur is brown, and there is a whitish arch above each eye. The nose-leaf, although lance-shaped, is somewhat oblong in its form, having the sides nearly parallel for some distance; and the wing-membranes are black. There is no tail. The species belongs to the sub-genus *Artibeus*.

This species usually inhabits caves and recesses in the rocks, in the former case generally keeping near the mouth of the cave; but when the geological structure of a district is unfavourable for the formation of caves, it takes up its abode during the day under the fronds of the cocoa-nut palm. At Aquatta Vale, in Jamaica, Mr. Osburn found these Bats clustering on the cocoa-nut trees so thickly, and in such numbers, that a single shot brought down twenty-two, while many others flew off, and took refuge in neighbouring trees. The food of this species consists of various fruits, the seeds and kernels of which are seen in abundance on the floors of the places where they repose during the day. Mr. Osburn mentions the bread-nut (*Brosimum*), the negro-cherry (*Cordia callococca*), the mango, and the rose-apple (*Eugenia jambos*), as fruits upon which it feeds in Jamaica. He also obtained from the intestines of several specimens numerous small seeds, which he believed to be those of the fustic (*Morus tinctoria*). The same observer noticed a curious habit of the species when alarmed—the little

* The rest of the species forming the group *Glossophagæ* have three premolars on each side in each jaw, and the inner upper incisors smaller than the outer ones. The lower incisors are more or less deciduous, and sometimes altogether wanting in the adult. *Lonchoglossa caudifera* has a well-developed zygomatic arch, and the interfemoral membrane, tail, and spurs very short. It is from Western Brazil and Surinam. The tail in this species is liable to be withdrawn, or lost in preparing the skin of the animal, and hence it has been described under the rather contradictory names of *caudifera* and *ecaudata*, and a distinct genus (*Anura*) was established upon the apparently tailless specimens. In *Glossonycteris lasiopyga* the zygomatic arch is deficient, and the tail is wanting; the spurs and interfemoral membrane are very short, and the latter is covered with hair. It is an inhabitant of Mexico. *Chœronycteris mexicana*, from Mexico, and *C. minor*, from Surinam, have a well-developed interfemoral membrane enclosing a very short tail. The anterior molars are very narrow, and the first upper premolar is deciduous.

† *Stenoderma perspicillatum*.

round ears were kept in a state of rapid motion, but alternately, so as to produce an effect like that of a person rolling his eyes different ways. The nose-leaf was also slightly moved.

THE JAMAICAN STENODERM.*

This is very nearly allied to the preceding species, from which it differs in its smaller size, being only about two inches and a half long, and in the form of the nose-leaf, which is lance-shaped, with regularly curved margins. It varies considerably in colour, but is usually of various shades of brown.

Mr. Gosse observed the habits of this and the preceding Bat in Jamaica, and describes them as exhibiting a special partiality for the fruit of the *Achras sapota*, called in Jamaica the naseberry, a preference already observed by Mr. A. Ricord in the case of the Spectacled Stenoderm. Mr. Gosse says:—"About a quarter of an hour after the sun has disappeared, and while the western horizon is yet glowing with those effulgent peak-like clouds which only a tropical sunset displays, we discover, by attentively watching the tree, the Bats begin to visit it. First one comes, takes a rapid flight around the tree, darts once or twice through the dense foliage, and winging away is lost in the light of the sky. Another and another comes immediately, and performs the same evolutions; and as the glory of the west fades away to a warm ruddy brown, like the blush of a mulatto girl, many dusky forms are discerned flitting round and round. By carefully following the flight of an individual with the eye, we perceive that now and then he alights for a moment on some object at the extremity of a bunch of leaves; but no sooner has the eye rested on the spot than the sooty wings are again spread, and he is pursuing his giddy course with his fellows. The object of his attention is a ripe naseberry, nestled in the midst of that rosette of leaves. Occasionally the weight of the suspended Bat dislodges the ripe fruit, and it falls to the ground, splitting with the shock. On picking it up, we see that it has been just bitten, not gnawed, as by the rodent incisors of a Mouse, but nibbled in a ragged manner. Though the Vampires often eat the fruit on the tree in this manner, detaching minute morsels, and again and again returning for more, it appears that not seldom they succeed in tearing out a large piece, which they carry away; for fragments of naseberry of considerable size, partly eaten by a Bat, are frequently found at the distance of half a mile from the nearest naseberry tree, dropped on the high road." Mr. Gosse adds that this Bat also feeds on the rose-apple, and Mr. Osburn describes it as consuming all the same fruits as the preceding species.†

THE DESMODUS.‡

The Desmodonts are in some respects among the most remarkable forms of Bats; indeed, their characters are so peculiar that it may be a question whether they ought not to form a distinct family in the order Chiroptera. By some zoologists, indeed, this course has been adopted, but as they agree

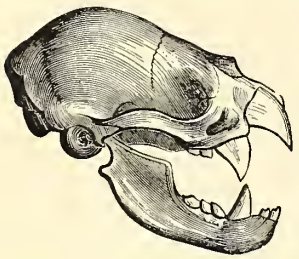
* *Stenoderma jamaicense.*

† Two other species of Stenoderms are referred to *Artibeus* by Professor Peters, namely, his *A. fallax* and *A. concolor*, both from Surinam. Both these have five molar teeth in the upper jaw, the preceding species having only four on each side. Three other species forming the sub-genus *Dermanura*, with only four molars on each side of both jaws, are *Artibeus cinereus* and *quadrivittatus*, from South America, and *A. toltecum*, from Mexico. *Phyllops albomaculatus*, from Cuba and Jamaica, and *P. personatus*, from Brazil, have five molars on each side in both jaws, and the palate is deeply cut out between the molars. In *Vampyrops lineatus* and *vittatus*, both South American species, the number of molars is also five, but the palate is not so deeply cut. The typical species of the genus *Stenoderma*, *S. rufum*, resembles this, but has only four molars on each side in each jaw, as described by Geoffroy, but this may be due to the youth of the specimen. *Pygoderma bilabiatum* and *Ametrida centurio* also have only four molars on each side, and the hindmost of these is very small. In the latter the face is much flattened. *Chiroderma villosum* and *pusillum*, on the contrary, have the fourth or hindmost molar larger than any of the rest, and are further characterised by a broad fissure which runs up from the aperture of the nose to the space between the orbits. *Sturnira lilium* and *chiliensis* have five molars on each side, and no interfemoral membrane. The former is from Brazil and Paraguay, the latter from Chili. *Brachyphylla cavernarum*, a curious Bat from caves in the islands of St. Vincent and Cuba, which is also said to occur in South Carolina, has an oval nose-leaf surrounded behind by a pit, a triangular fissure in the lower lip, and a rudimentary tail; and the singular genus *Centurio*, including two species (*C. senex* and *McMurtrii*), found in the West Indies and Central America, have a big, Bull-dog-like head and a flat face covered with naked cutaneous leaves. The teeth in *Centurio* resemble those of the Spectacled Stenoderm. There is no tail, and the wing-membranes display peculiar translucent patches.

‡ *Desmodus rufus.*

with the Phyllostomidæ in the presence of nasal appendages, and in the possession of three phalanges in the middle finger, we have preferred to leave them in that family, at the same time indicating their striking divergences from all its other members.

The dentition in these Bats is most singular, and as we shall see, its peculiarities are so associated with the exceptional habits of the animal, as to have far greater weight in the question of classification than we have accorded to the dental characters in other families. In fact these peculiarities, in combination with certain points of internal anatomy, are so remarkable that Professor Huxley has suggested the formation for the Desmodonts of a distinct group (*Hæmatophilina*) of the Microchiroptera, which he apparently regards as equivalent in classificational value to all the rest of the sub-order taken together.



SKULL OF DESMODUS. (*Nat. Size.*)

The remarkable conformation of the teeth will be easily seen by reference to the annexed figure. The upper incisor teeth, four * in number in the young animal, become reduced to two in the adult, but these are of enormous size, prominent, triangular, and very sharp. The lower incisors, on the contrary, are small and have a two-lobed crown. The canines of the upper jaw are nearly of the same form as the incisors, but rather smaller; those of the lower jaw present no remarkable peculiarity. The molar series of teeth, however, are most peculiar—there are two in the upper and three in the lower jaw, but the whole of them are small, compressed, sharp-edged, and furnished with only a single root, thus presenting the characters of premolars, as which, indeed, they are regarded by some writers. If this view of their nature be correct the Desmodonts have no true molars.

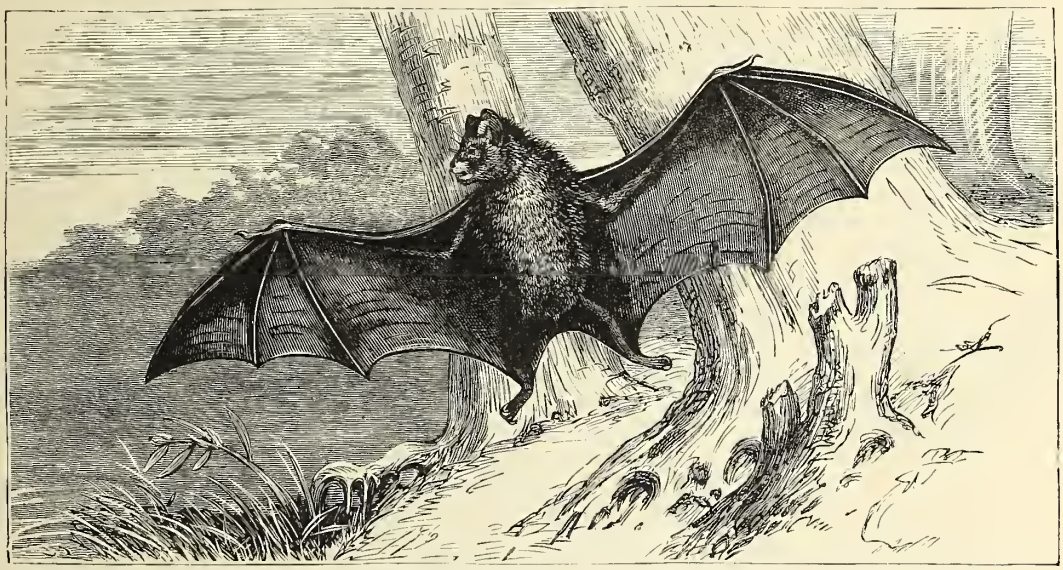
In general characters these Bats approach the Stenoderms. The tail is entirely deficient; the interfemoral membrane forms a mere border to the legs; the ears are of moderate size and furnished with a small tragus; and the nasal appendage consists only of the part analogous to the horseshoe in other genera, the upper leaf being absent. The thumb is very long and strong. The only species of the genus *Desmodus* (*D. rufus*) measures about four inches in length, and some fifteen or sixteen inches in expanse of wing. The fur varies considerably in colour, but generally shows various tints of brown, from a reddish-brown, as in the specimen originally described by Prince Maximilian, through a plain brown, to ashy-brown and mouse-colour, variations which have induced zoologists to describe several distinct species, now, however, generally regarded as identical. This species in its various forms seems to be very generally distributed in all the warmer parts of South America, from Chili to Guiana. As already stated, it appears to be the only species that has been detected in the act of blood-sucking; and by some of the most recent authorities it and its near ally, *Diphylla ecaudata*, are believed to be the only South American Bats which are really guilty of that atrocity.

Dr. Hensel, who has discussed this matter at some length, in connection with his observations on the Bats of Brazil, remarks that the teeth of most of the Phyllostomidæ are like those of the true Carnivora, and the wounds inflicted by them, as may easily be observed by the captor of one of them, are of the same kind as those produced by the teeth of a small Carnivore. In the latter, as he says, there is no loss of substance; the bite consists usually of four punctures, where the canine teeth have pierced the skin, and severe bleeding occurs only when these teeth have penetrated to some depth, and injured one or more of the larger vessels.

But the wounds observed on Horses or Mules that have been bitten by blood-sucking Bats are, as already stated, of quite a different character. They form small oval surfaces, which are but slightly sunken, the surface of the cut not being perpendicular to that of the spot bitten, as would be the case in wounds produced by long canine teeth, but in a general way parallel to it. A similar wound would be produced by lifting a small portion of skin by means of a pair of forceps, and then passing a knife along the surface of the skin, as if to shave it, but so as to cut away the raised portion. By a cut or bite of this kind, notwithstanding its being so superficial, a portion of substance is always lost, a great number of fine cutaneous vessels are cut through, and an abundant and long-continued bleeding is

* According to Professor Gervais; some zoologists make the number of incisors in the first dentition six. The first teeth differ entirely in character from those of the adult animal.

caused.* Such wounds, says Dr. Hensel, can only be produced by large, peculiarly shovel-like, and very sharp incisor teeth, and such teeth occur only in the allied genera *Desmodus* and *Diphylla*. With the latter he had no acquaintance, but he obtained *Desmodus rufus* in abundance. He says it usually lives in cavities in the rocks, but sometimes in large hollow trees. "In capturing these animals," he adds, "I have often had the opportunity of observing the wounds that they inflicted on the noses of my Dogs which tried to seize them, or on my own hands, and found that they perfectly resembled those of the Horses bitten by the blood-suckers. The creatures bite with the rapidity of lightning, and even when they seem merely to touch the skin, a piece of it is found to be deficient. They cannot therefore hold fast with their teeth, as all other Phyllostomidæ do, for these, when they are captured, in their rage seize with their teeth any object within their reach, and hold it for some time." It would appear, especially from the rudimentary state of their molar teeth, that these Bats cannot be supposed to prey upon insects, no remains of which have ever been found in their stomachs, and



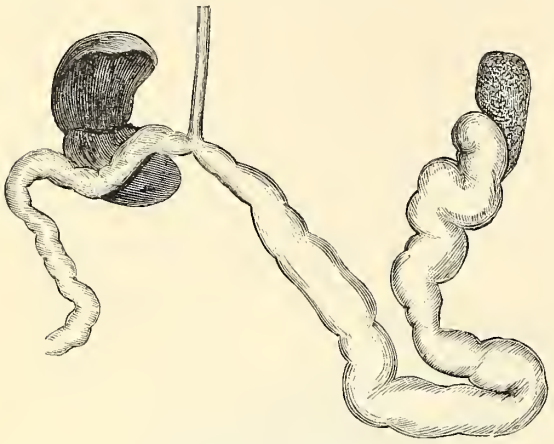
DESMODUS. (*One-third Natural Size.*)

their excrements consist solely of a black, pitch-like paste, evidently digested blood. This is evacuated near the entrance of the caves in which the creatures live, and while they are waiting until the darkness outside is sufficient for them to start on their piratical excursions. The floor at such a place is found covered with a layer of the above-mentioned black mass, which may attain a thickness of a foot or more. Dr. Hensel mentions that a large Dog, after paying a visit to one of the caverns haunted by these Bats, looked as if he had got long black boots on. The same writer is of opinion that the Bats must obtain the greater part of their food by capturing and sucking the blood of the smaller warm-blooded animals. As the large domestic animals are not indigenous to America, it is probable that they only furnish an occasional meal to some of the great swarms of these Bats that infest the country.

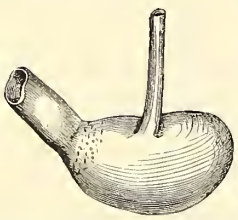
That the Desmodus is specially organised for a peculiar diet is shown by the extraordinary structure of its stomach, which, as described by Professor Huxley, whose observations are confirmed by Professor Peters, differs from that of any other Mammal. The gullet (*g* in figure) is exceedingly narrow, and opens into a transversely elongated tubular stomach, which passes directly on the right side into the intestine (*i*), the duodenum and stomach not being separated by any pyloric constriction, and

* The wound is, in fact, very much like that which many of our readers must occasionally have inflicted on themselves in shaving; and those who are experienced in such matters will know how long it takes to stop the bleeding thus produced.

the limit of the stomach in this direction being indicated solely by the insertion of the gall-ducts at a point only one-fifth of an inch from the opening of the gullet. The other, or cardiac division of the stomach, on the contrary, is enormously developed, forming an elongated and convoluted cæcum (*c*) several inches long, and becoming considerably wider than at its origin. In one specimen examined, the body of the Bat measured only three inches and one-fifth in length; the intestine, from the pylorus to its termination, was eleven inches long; while the above-mentioned cæcal portion, when straightened out, was six inches and a half in length, or twice as long as the body, and nearly two-thirds the length of the intestine. Professor Peters describes the cardiac cæcum in the specimen examined by him as only from one to two inches long. It may, perhaps, have belonged to a distinct species. The stomach in the Frugivorous Pteropidæ is elongated and tubular, no doubt for the reception of the large quantity of vegetable food which they require to support their existence. In the ordinary Insectivorous Bats the organ is small and globular, with the pyloric and cardiac orifices near each other, the nourishment afforded by their usual diet being in a tolerably concentrated form and firm condition. The extraordinary cæcum of the blood-suckers, no doubt, serves as a reservoir for their fluid nutriment, in which it may be stored for a time almost unchanged, and gradually subjected to the process of digestion.



STOMACH OF DESMODUS.



STOMACH OF LONG-EARED BAT.
(*Twice Natural Size.*)

STOMACH OF PTEROPUS.

The second species of blood-sucking Bat mentioned in the earlier part of this article, *Diphylla ecaudata*, agrees with the Desmodus in its dentition and general characters, but is entirely destitute of interfemoral membrane, and has the lower incisors pectinate.

The following table of the classification of Bats here adopted will assist the reader in the comprehension of the information given in the preceding pages:—

SUB-ORDER I.—MEGACHIROPTERA.

Family I.—PTEROPIDÆ.

Group 1.—*Pteropi.*—Tongue moderate; molars well developed. Genera.—Pteropus, Cynopterus, Cynonycteris, Harpyia, Epomophorous, Hypsignathus, and Cephalotes. **Group 2.**—*Macroglossi.*—Tongue very long; molars very small. Genera.—Macroglossus, Eonycteris, and Notopteris.

SUB-ORDER II.—MICROCHIROPTERA.

A.—*Vespertilionine Alliance.*

Family II.—RHINOLOPHIDÆ.

Sub-family 1.—Rhinolophinæ.—First toe with two, remainder with three phalanges. Genus.—Rhinolophus.

Sub-Family 2.—Phyllorhininæ. Toes equal, each of two phalanges. Genera.—Cœlops, Phyllorhina, Rhinonycteris, and Triænops.

Family III.—NYCTERIDÆ.

Sub-family 1.—Nycterinæ.—Nasal apparatus concealed; tail long. Genus.—Nycteris.

Sub-family 2.—Megadermine.—Nose-leaf distinct; tail short. Genus.—Megaderma.

Family IV.—VESPERTILIONIDÆ.

Group 1.—*Vespertiliones.*—Crown of head flat, or nearly so; upper incisors close to canines; ears moderate, separate. Genera.—Vespertilio, Vesperugo, Chalinolobus, Scotophilus, Nycticejus, Atalapha, and Kerivoula.

Group 2.—*Plecoti.*—Head and incisors as above; ears very large, generally united. Genera.—Plecotus, Synotus, Histiotus, Otonycteris, Corinorhinus, Nyctophilus, and Antrozous.

Group 3.—*Miniopteri.*—Crown greatly elevated; upper incisors separated from canines. Genera.—Natalus, Miniopterus, and Thyroptera.

B.—*Emballonurine Alliance.*

Family V.—EMBALLONURIDÆ.

Sub-family 1.—Emballonurinæ.—Tail slender; upper incisors weak. **Group 1.**—*Emballonuræ.*—Frontal bones convex. Genera.—Furia, Saccopteryx, Rhynchonycteris, and Emballonura. **Group 2.**—*Taphozoi.*—Frontal bones with a concavity; pre-maxillary bones separate in front. Genera.—Coleura, Taphozous, Dichdurus.

Group 3.—*Rhinopomata.*—Frontal bones concave; pre-maxillaries united (a small nose-leaf). Genus.—Rhinopoma.

Group 4.—*Noctiliones.*—First phalanx of middle finger extended in repose. Genus.—Noctilio.

Sub-family 2.—Molossinæ.—Tail thick; upper incisors strong.

Group 5.—*Molossi.*—Middle finger with two phalanges. Genera.—Mormopterus, Molossus, Nyctinomus, and Chiromeles.

Group 6.—*Mystacinæ.*—Middle finger with three phalanges. Genus.—Mystacina.

Family VI.—Phyllostomidæ.
Sub-family 1.—Lobostominæ.—Nostrils in front of muzzle; chin with erect cutaneous ridges. Genera.—Chilonycteris, Pteronotus, Mormops.
Sub-family 2.—Phyllostominæ.—Nostrils on upper surface of muzzle; chin with warts. **Group 1.**—*Vampyri.*—Molars with W-shaped cusps; four upper incisors; muzzle long; tongue moderate. Genera.—Macrotus, Lonchorhina, Macrophyllum, Vampyrus, Schizostoma, Lophostoma, Trachyops, Phyllostoma, Carollia, Rhinophylla. **Group 2.**—*Glossophagæ.*—Like the Vampyri, but tongue very long, and lower lip divided by a deep groove. Genera.—Glossophaga, Monophyllus, Ischnoglossa, Phyllonycteris, Lonchoglossa, Glossonycteris. **Group 3.**—*Stenodermata.*—Muzzle short; molars with a cutting outer edge; four upper incisors. Genera.—Stenoderma, Artibeus, Phyllops, Vampyrops, Pygoderma, Ametrida, Chiroderma, Sturnira, Brachyphilla, Centurio. **Group 4.**—*Desmodontes.*—No true molars; two upper incisors. Genera.—Desmodus, Diphylla.

We have already remarked that of these families the Vespertilionidæ may be regarded as the types of the whole order; they realise all the notions that we form in our minds when we speak of "a Bat," and this with the greatest simplicity, or with the smallest amount of complication from subordinate characters. Next to them in this respect come some of the Emballonuridæ. The other families group themselves round these, or the whole of the other Microchiroptera may be said to surround the Vespertilionidæ. Mr. Dobson, accepting the notion of the origin of organic forms by a process of evolution, assumes an unknown group of ancestral forms (*Palæochiroptera*) from which in the first place the Vespertilionidæ and Emballonuridæ diverge, forming the roots of his two "alliances." From the Emballonuridæ proceed the Phyllostomidæ, and from the Vespertilionidæ the Nycteridæ and Rhinolophidæ. From this point of view these Bats may be regarded as allied to the Insectivora through some unknown common ancestors; but what these may have been, or by what stages the Bat-type originated from the ordinary quadruped, it is very difficult to imagine. The facts of geographical distribution go far, however, to confirm the view that the Vespertilionidæ and Emballonuridæ are the central and oldest types of Bats; their distribution is world-wide, and even some nearly allied forms are found in very distant parts of the world. The other families are more restricted in their range, the Nycteridæ and Rhinolophidæ being confined to the Eastern, and the Phyllostomidæ to the Western hemisphere, and chiefly to the warmer zones, whereas the Vespertilionidæ extend much further to the north.

The Pteropidæ, or Frugivorous Bats, however, cannot well be brought into this scheme of descent. They stand completely isolated from the rest of the order, and their peculiar distribution would almost seem to indicate that their origin and relationships were distinct from those of the other Bats. Their range, which sweeps round the shores of the Indian Ocean from the Cape of Good Hope to Australia, and extends, perhaps somewhat exceptionally, into the islands of the Pacific, although it cannot be said to coincide with that of the Lemuroids, being so much wider, at least includes the whole of the localities in which the latter are met with; and if the Lemuroids are really, as seems probable, segregated descendants of a great fauna which inhabited the supposed sunken continent of "Lemuria," the same origin may fairly be ascribed to the Pteropidæ, and their wider distribution may be accounted for by their much greater power of locomotion. In connection with this it is interesting to note the strong Lemurian resemblances presented by many of the Pteropidæ; and further, the sort of common point of junction between the Lemuroids, the Pteropids, and the Insectivora, furnished by that curious animal the *Galeopithecus*, or Flying Lemur, which is also still an inhabitant of a region haunted by Lemuroids and Pteropine Bats. The Pteropidæ thus seem to stand quite apart from the other Bats. From a genealogical point of view, which indeed is that which we always take of the relationships of animals, whether we believe in the doctrine of descent or not, we may ask whether the two sub-orders of Bats have not been realised in their present form through two quite different series of modifications.

The appeal to fossil evidence, which in some cases leads to satisfactory results, gives us no clue to the origin of the different groups of Bats. Of the Pteropidæ no fossil remains are known. Of the other families the most ancient remains are, as might be expected, those of the Vespertilionidæ, several species of which have been found in Miocene beds at Mayence and in the south of France, and even in the Eocene gypsum deposits of the Paris basin. Other bones identical with those of species now living in the same localities have been detected in bone-caves in various parts of Europe. Bones of a *Rhinolophus* have occurred in the cavern of "Kent's Hole," near Torquay; and the celebrated bone-caves of Brazil have furnished numerous remains of Bats, all of which, however, are referable to the peculiarly South American family Phyllostomidæ. Thus, so far as we are acquainted with them, the fossil remains of Bats, even the most ancient, indicate only forms more or less nearly related to those still existing in the same localities, and furnish us with no means even of speculating upon the course of events by which, so to speak, the type of the Chiroptera was evolved.

W. S. Dallas.

LOW'S PTILOCERQUE.

ORDER INSECTIVORA.

CHAPTER I.

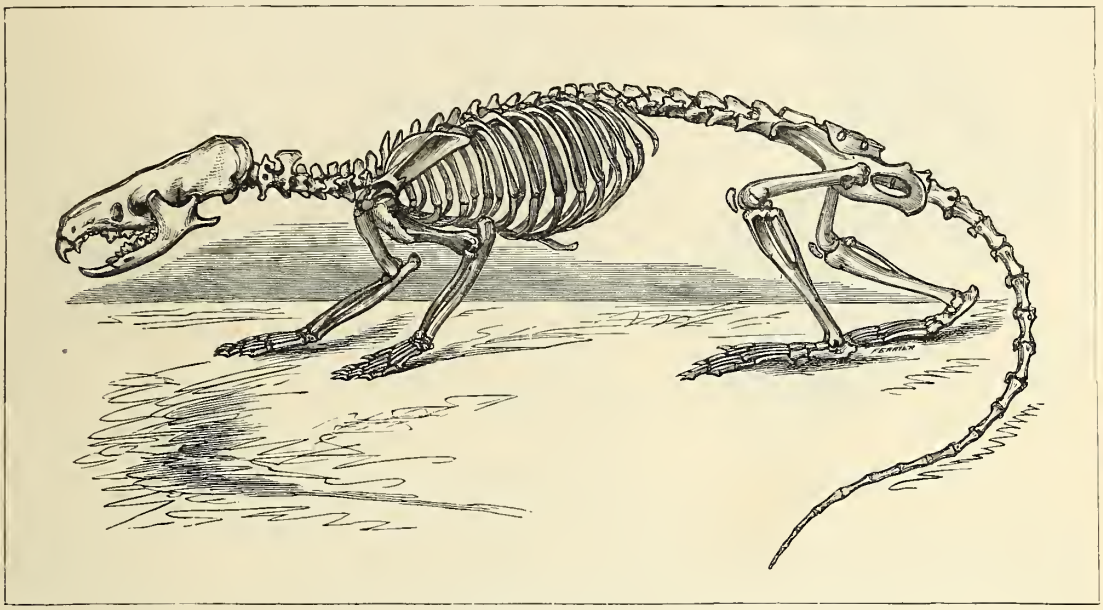
COLUGOS—BANGSRINGS—JUMPING SHREWS—HEDGEHOGS—TANRECS—RIVER SHREWS.

Functions of the Insect-eaters in the Order of Nature—Their leading Peculiarities—Classification—COLUGOS—Various Opinions regarding their Place—COLUGO, OR FLYING LEMUR—The *Patagium*—Parachute-like Membrane—Dentition—Offspring—Diet—BANGSRINGS—TANA—FERRUGINOUS BANGSRING—HORSFIELD'S BANGSRING—LOW'S PTILOCERQUE—SHORT-TAILED BANGSRING—JUMPING SHREWS—ELEPHANT SHREW—ALGERIAN JUMPING SHREW—PETRODROME—RHYNCHOCYON—HEDGEHOG—Characteristics—Distribution—Diet—Attacks Snakes and Vipers—Taste for Eggs and Game—Its "Spiny Skin"—"Rolled up"—Enemies—Female and Young—LONG-EARED HEDGEHOG—COLLARED HEDGEHOG—BULAU—TANRECS—TANREC—TENDRAC—TELFAIR'S TENDRAC—RICE TENDRAC—EARED EARTH SHREW—AGOUTA—ALMIQUI—WEST AFRICAN RIVER SHREW.

IN the grand economy of nature small things play sometimes very considerable parts; and the innumerable hosts of insects, making up by their numbers for their individual insignificance, are of very great importance in a great variety of fashions. One of their most striking functions is undoubtedly the checking of vegetable growth. They attack plants in all parts—in the roots, the stem, the branches, the leaves, and the flowers and fruit—in this way, while merely obeying their own appetites, imposing a constant check upon the increase of vegetation; and being for the most part specially confined to particular plants or groups of plants, they assist materially in preserving the balance of power in the vegetable world. At the same time, it must be borne in mind that there is the same tendency in insects, as in any other group of organisms, to inordinate increase. The checkers thus need a check in their turn, and the number of other creatures whose business it seems to be to keep down the undue multiplication of insects is exceedingly great.

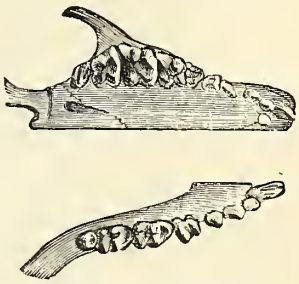
We have seen that among the Mammalia the Bats for the most part have this duty imposed upon them. They attack the winged armies of perfect insects in the air, and must cut off an enormous number of potential parents of plant-eating larvæ. But there are a great many insects which

seldom or never rise into the air, and the larvæ of those which are aerial in their perfect state are of necessity confined to the ground or the vegetation growing on it; these are not without their



SKELETON OF SHREW.

Mammalian enemies. Many Mammals of the Carnivorous and Marsupial orders feed wholly or partially upon insects; but there is one order most of the species of which are exclusively, or almost exclusively, confined to a diet of terrestrial insects, worms and "such small deer," and which has consequently received the name of Insectivora, or "the insect-eaters." On trees, on the ground, and even beneath its surface, and in the water, these animals chase insects and their larvæ; and if they diversify their diet with worms and other invertebrates, or by attacking and devouring frogs, fishes, and small birds and Mammalia, or even in some cases feed chiefly upon such articles, or on fruit, the predominating taste for insects among the members of the order may justify the name.



DENTITION OF HEDGEHOG.
(*Natural Size.*)

The Insectivora are in many respects related to the Bats, and in some cases show a sort of affinity to the lower Quadrumana. In appearance many of them show analogy to different families of Rodents, or gnawing Mammals, the Shrews especially being exceedingly mouse-like in their aspect; but, as might be expected from the difference in the habits, and especially in the diet of the animals, the simple inspection of the teeth is always sufficient to distinguish the members of these two orders.

The leading peculiarities of the Insectivora may be briefly indicated, with reference to the groups which approach them most closely in certain points of structure. The limbs are all organised for walking or digging, the fore limbs never being modified, as in the Bats, into organs of flight, and the two bones of the fore-arm (*radius* and *ulna*) are always more or less distinct. There is no opposable thumb, either on the fore or the hind feet. The teeth, which are always encased in enamel, are of the usual three kinds—incisors, canines, and molars *—and the dentition generally resembles that of the strictly Insectivorous Bats, the molars

* There is sometimes a difficulty in distinguishing between canines and premolars, and it will be seen, hereafter, that in some cases the canines are supposed to be wanting; but no Insectivora possess two chisel-like, constantly-growing incisors in each jaw, separated by a long interval from the molars as in the Rodents, or Gnawing Mammals.

especially being similarly furnished with several sharp cusps or points, which are regarded as characteristic of Insect-eating Mammals. All the teeth are implanted in the jaws by roots.

In the development of the tail, and the nature of the covering of the skin, the Insectivora present considerable diversities, which will be referred to hereafter. Their feet generally consist of five toes, all armed with claws, and nearly all are plantigrade—that is to say, they apply the whole, or nearly the whole, of the sole of the foot to the ground in walking. With a single exception (*Potamogale*, which is rather anomalous in some other respects), all the Insectivora are provided with complete clavicles, or collar-bones—a character which serves to distinguish them from the Carnivora, in which the collar-bones are either deficient or imperfectly developed. The teats are generally numerous, and situated on the abdomen, the only exceptions being the anomalous Colugo, or so-called Flying Lemur, and the Golden Moles, in which the teats are situated on the breast.

Zoologists are now pretty well agreed as to the classification of these animals, although there are still differences of opinion as to the best arrangement of the families, and some minor points. The classification here adopted is founded upon that proposed by Professor Mivart in 1871, and afterwards modified by Professor Theodore Gill. In this the whole order is divided into nine families, the first of which is so anomalous, and so divergent from all the rest in its characters, as to have led to its being treated as constituting a distinct sub-order (Dermoptera).

FAMILY I.—GALEOPITHECIDÆ, OR COLUGOS.

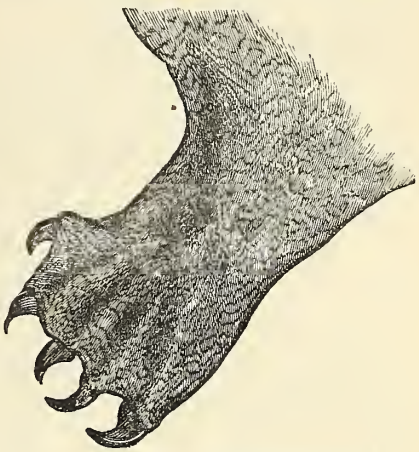
The animals which constitute this family, now regarded as constituting only two species (although the right even of one of these to specific rank is somewhat doubtful), are in truth amongst the most anomalous of Mammals. In their characters they present the most singular resemblances to at least three orders of Mammalia, in which they have been successively placed by various zoologists. Discovered by the Dutch voyagers of the seventeenth century in the luxuriant forests of the Eastern islands, their general Lemur-like aspect led the naturalists of those days to class them with those creatures, and Camelli, the distinguished botanist, gave them the name of *Galeopithecus*, which became in Petiver's hands, "*Cato-simius volans*," or the Flying Cat-Monkey. Seba left out the Monkey, and called the animal simply the Flying Cat of Ternate (*Felis volans ternatea*); whilst Bontius, laying undue weight on its so-called flying powers, regarded it as a Bat, and gave it the name of *Vespertilio admirabilis*. Linnæus accepted the Lemur hypothesis, and placed the animal in his genus *Lemur*, under the name of *Lemur volans*, or the Flying Lemur, and this position it continued to hold for a very long time, although Pallas separated it from the true Lemurs under Camelli's name of *Galeopithecus*. No one ever reverted to the notion that the Colugo was a Bat, but from time to time various naturalists have pointed out that in many of its characters it approached the Insectivora; and of late years the evidence in favour of its belonging to that order has been put forward so strongly, that nowadays nearly all zoologists regard it as an exceedingly aberrant member of the group, with more or less distinct tendencies towards the Bats and the Lemurs, and perhaps with some faint trace of the Marsupial about it. Mr. Wallace, speaking, of course, from the standpoint of the theory of evolution, says that "this animal seems, in fact, to be a lateral offshoot of some low form, which has survived during the process of development of the Insectivora, the Lemuroidea, and the Marsupials, from an ancestral type." There is no doubt that the beast is sufficiently dissimilar from all other known Mammals to give a considerable air of probability to the assumption of its being a survivor from some earlier period of the earth's history; but as it is here we must do the best we can with it, and its natural position is certainly between the true Insectivora and the Lemurs. As the characters of the family are founded virtually upon a single species, one description will serve.

THE COLUGO, OR FLYING LEMUR.*

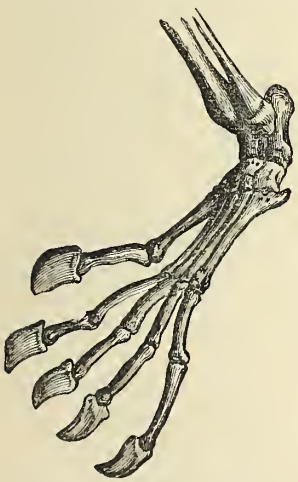
The species known to the older naturalists is found in Malacca, Sumatra, and Borneo, where it inhabits the forests, climbing the trees like a Squirrel by the aid of its claws, and passing through the air from one tree to another by means of a membrane (*patagium*), which extends along the sides of the

* *Galeopithecus volans.*

body, and can be stretched by the extension of the limbs to which it is attached so as to act as a sort of parachute, which supports its owner after the same fashion as the very similar fold of skin that exists in the same position in the so-called Flying Squirrels and Flying Opossums. In the Colugo, however, this curious arrangement is carried further than in the other groups of Mammals just mentioned; for, as in the Bats, there is a distinct antebrachial membrane, stretching along the front of the arms from the wrists to the sides of the neck; and the space between the hind limbs is occupied by an ample triangular membrane, down the middle of which the long tail passes, and which is also stretched by the extension of the limbs. Even the toes are joined by membranes as far as the base of the claws, and this great development of the skin must be regarded as to a certain extent approximating the creature to the Bats. The whole of this fold of skin is clothed both above and beneath with hair; and although some observers have described the animal as moving its expanded membranes during flight, no approach to the peculiar action of the Bat's wing can ever be made by it. The most striking point in which it exceeds the other parachute-bearing Mammals is the development of the membrane between the hind limbs, and this, by the action of the tail, may be made to exert a powerful influence upon the course of the animal during its so-called flights. Mr. Wallace, who had the opportunity of observing the Colugo in its native haunts, describes its flight as follows:—"Once, in a bright twilight," he says, "I saw one of these animals run up a trunk in a rather open place, and then glide obliquely through the air to another tree, on which it alighted near its base, and immediately began to ascend. I paced the distance from the one tree to the other, and found it to be seventy yards, and the amount of descent I estimated at not more than thirty-five or forty feet, or less than one in five. This, I think, proves that the animal must have some power of guiding itself through the air, otherwise in so long a distance it would have little chance of alighting exactly upon the trunk." In a subsequent work, following other writers, he refers this power to the agency of the tail, and even thinks that the animal may rise over obstacles in its course by the elevatory action of that organ. The tail is of considerable length, and according to some writers its extremity has a slight prehensile action which is of assistance to the animal in climbing. The membranes, when not in use, as when the Colugo is walking or climbing, fall in great folds at the sides of the body.



HIND FOOT OF COLUGO. (*Four-fifths Natural Size.*)

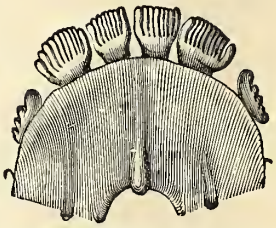


BONES OF HIND FOOT OF COLUGO (*Four-fifths Natural Size.*)

Passing now, by a natural transition, from the parachute-like membranes to the limbs which traverse and serve to extend them, we find that these exhibit certain peculiarities of structure which are amongst the anomalies of this singular creature. The bones of both fore and hind limbs are elongated and slender—a character which contrasts strongly with the general state of things in the Insectivora—and the ulna, which is particularly slender, is united to the radius towards the extremity. The feet consist of five digits, and they are specially adapted to enable the animal to climb readily upon the bark of the trunks and branches of trees. In the hind feet especially part of the tarsal bones (the navicular and cuboides) are constructed so that they can easily turn upon the astragalus and calcaneum, and thus the sole is turned inwards, an arrangement which facilitates the clasping action of the feet. The inner digits in all the feet possess considerable power of independent motion, although they are never converted into opposable thumbs; and this arrangement, combined with the presence of sharp strong claws upon all the toes, must greatly favour the peculiar mode of life of the animal. It is to be remarked that the structure of the hind feet presents some analogy to that prevailing in Bats, and that in repose the Colugo suspends itself from a branch by

the fore and hind feet, with the body and head hanging downwards, which is also a habit somewhat reminding us of the Chiroptera.

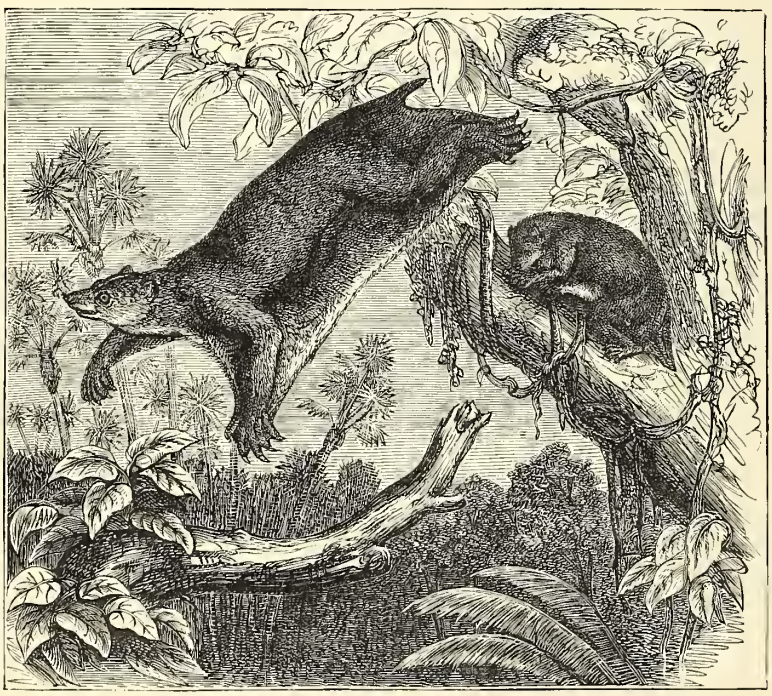
The head in the *Galeopithecus* is tolerably broad and a little flattened; the eyes are placed more laterally than in the Lemurs, and the orbits containing them form a bony ring which is interrupted behind.



LOWER INCISORS OF COLUGO.
(*Twice Natural Size.*)

The teeth are very peculiar. In the upper jaw there are on each side two incisors, those of one side separated from those of the other by a very wide space. The foremost of these incisors on each side has a single root and a notched crown; the hinder one is pointed and implanted by two roots. The canine which follows also possesses two roots; and this is followed by a molar series of five teeth, each inserted into the maxillary bone by three roots, and having a crown with three, four, or five cusps. In the lower jaw, which has the condyle curiously produced outwards, we find again on each side a series of five molar teeth, and in front of these a long canine with two roots; but the whole fore part of the jaw is occupied by six single-fanged incisors; the crowns of these are nearly horizontal, broad, flat, and notched, the notching of the two middle pairs being so deep as to form a regular comb. This structure is exceedingly remarkable, and occurs in no other animals, the nearest approach to it being the slightly pectinated teeth in the Desmodont Bats.

The teats in the *Galeopithecus* are situated on the sides of the breast, in the neighbourhood of the armpits. There is a pair on each side, placed close together, and on the same level. The female produces only a single young one at a birth, and the little creature, described by Mr. Wallace as at first very small, blind, and naked, clings closely to the breast of the mother, which is quite bare and very much wrinkled. Mr. Wallace sees in this adaptation of the region of the teats to the wants of an exceedingly incomplete offspring, some trace of a remote relation to the peculiarities of the Marsupials. The stomach in this curious animal is of considerable size; and the intestine is furnished with a sacculated cæcum as long as the stomach.



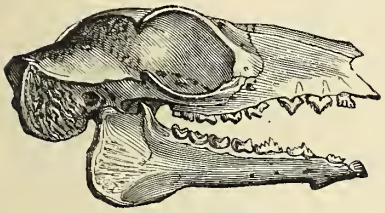
COLUGO.

The Colugo varies considerably in colour, but is usually of an olive, brown, or blackish colour, mottled with whitish spots and blotches, which are said by Mr. Wallace to give it a resemblance to the colour of mottled bark, sufficient to render it difficult of observation. The lower surface of the body and membrane is of a tawny grey colour, and the whole of the fur which clothes the body and membranes is, although short, most exquisitely soft in texture. The length of the animal is about eighteen or twenty inches.

The brain in the *Galeopithecus* is very small, and Mr. Wallace found it to possess such a remarkable tenacity of life that it was killed with difficulty by any ordinary means. He describes it

as sluggish in its habits, at least during the day, when it generally rests clinging to the trunks of trees, and at this time, if it has occasion to move, it goes up the tree by short runs of a few feet, and then stops a moment as if it found the action difficult and fatiguing. We have already quoted Mr. Wallace's description of the flight of the animal as witnessed by him early in the evening, and no doubt it is active enough during the dark hours.

The regular food of the Colugo appears to consist of vegetable substances, but authors differ somewhat in their statements upon this subject. By most zoologists it is said to feed on fruits; but Mr. Wallace says that "like the cuscus of the Moluccas, the *Galeopithecus* feeds chiefly on leaves." From the statements of some naturalists it would seem that it occasionally or habitually adds insects to its diet, and also that it frequently captures and devours small birds. In all probability the truth is that it eats almost anything that comes in its way.



SKULL OF COLUGO.

Some five or six supposed species of *Galeopithecus* have been described by various authors, but most of these are now admitted to be founded upon young animals, or upon mere varieties. The Colugo of the Philippine Islands is, however, generally regarded as a distinct species, although even as to this there is some doubt. It was described by Mr. Waterhouse as *Galeopithecus philippinensis*, and presents a close general resemblance to the species above described, but is smaller, has a shorter head, and shows certain slight differences in the teeth.

FAMILY II.—TUPAIIDÆ, OR BANGSRINGS.

The preceding family, as already stated, is regarded by Mr. Gill as constituting an actual sub-order of Insectivora, and we have seen that its characters are really of a very singular kind. The remainder of the order is treated by him as forming a single great group, characterised by the absence of parachute membranes, the shortness and robustness of the limbs, and by the want of that peculiar comb-like structure of the incisor teeth which distinguishes the *Galeopitheci* from all other Mammals. Moreover the condylar process of the lower jaw is never extended outwards. This group Mr. Gill proposes to name *Bestiæ* or *Insectivora vera*.

The Bangsrings, or Sinsrings, form the first family, called Tupaiidæ, from the name of the most characteristic and best known genus *Tupaia*, which again was derived by its discoverer and first describer, Sir Stamford Raffles, from the native name for a Squirrel, with which these animals are confounded by the Malays of Sumatra. The Bangsrings have either four or six incisors in the upper, and always six in the lower jaw; and three or four premolars, and four true molars on each side in both jaws. The canines are situated far back, and have a single root. In the skull the orbit is usually complete, or nearly so, and there is a complete zygomatic arch, with a small slit or aperture beneath the orbit. The bones of the shank are separate; the intestine has a large cæcum; and the feet are furnished with five toes, armed with strongly curved claws. The upper molar teeth are formed of two nearly equal parts, anterior and posterior, each of which represents a triangular prism narrowed inwards.

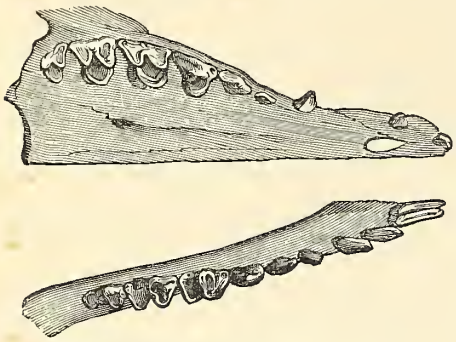
The Bangsrings live in and about trees, where their activity and general appearance give them a considerable resemblance to small Squirrels or Lemurs. They also remind one considerably of some of the smaller Marsupials. Their fur is exceedingly fine and soft; their tail generally long and well-clothed with hair (except in *Hylomys*); and their food consists partly of fruits and partly of insects. The species inhabit South-eastern Asia and the islands of the Eastern Archipelago.

THE TANA.*

In the genus *Tupaia* (or *Cladobates*) from which the present family takes its name, there are four small incisor teeth separated from each other in the upper jaw; and six incisors, the middle four of which are close together, long, and much inclined forwards in the lower jaw. The upper canines are at

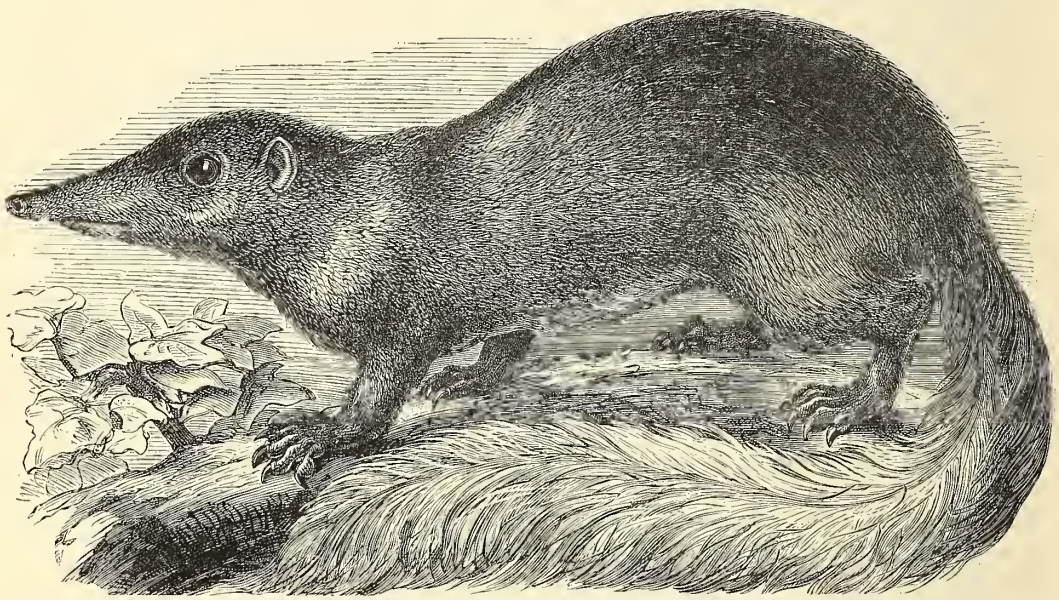
* *Tupaia tana.*

some distance from the hindmost incisors, the lower ones close to them (see figure). Behind the canines there are on each side in both jaws three premolars, which increase in size backwards. These are followed by three true molars. The bony orbit is a complete ring, and the zygomatic arch is also complete, but perforated by an elongated aperture. The ears are of moderate size, and rounded; the eyes large and prominent; and the tail long, and well clothed with hair throughout its whole length; in fact in most species it is a bushy organ like that of many Squirrels.



DENTITION OF FERRUGINOUS BANGSRING.
(Twice Natural Size.)

In the Tana (*Tupaia tana*) the arrangement of the hair on the tail in two rows, something after the fashion of the barbs of a feather on the shaft, which is more or less recognisable throughout this genus, is especially remarkable; and as the hair is very long, the tail is rendered particularly bushy. This animal is one of the larger species, the body measuring from eight to nine inches in length, and its colour is rather variable, although usually exhibiting various shades of reddish-brown, becoming darker or blackish on the hinder part of the back, where, moreover, the greater part of the hairs are of uniform tint and not grizzled. The colour of the tail appears to be especially liable to vary—thus, according to Dr. Günther, in the ordinary form of the species the tail is black above, with the basal half of each hair rusty brown, and dark brown below; in another variety, described by Wagner as a distinct species under the name of *T. speciosa*, the tail is brownish-red above, and bright rusty-red below; whilst in the beautiful form from which our



TANA—GOLDEN-TAILED VARIETY. *(Half Natural Size.* From the *Proceedings of the Zoological Society.)*

illustration is taken the whole organ is of a reddish golden-yellow colour. This is Dr. Günther's variety, *chrysura* (golden tail).

The Tana is an inhabitant of the forests of Sumatra and Borneo. According to Sir Stamford Raffles, the animal is known to the country people of Sumatra under the name of *Tupai tana*, and he was informed that it was always found on or near the ground. A nearly allied but much smaller species (*T. splendidula* of Dr. Gray) occurs with it in the last-named island; and another larger one (*T. nicobarica*) is found in the Nicobar Islands.

THE FERRUGINOUS BANGSRING.*

This species, the *Tupai Press* of the Malays of Sumatra, and the *Kekkes* of the Sundanese in Java, is more widely distributed than the preceding, being found not only in the two islands above mentioned, but also in Borneo, Penang, and Singapore. It was first described by Sir Stamford Raffles. It is one of the larger species, the head and body measuring about eight inches, and the tail being fully of equal length. The colour of its fur is almost entirely a rusty red, becoming darker, however, on the tail and the hinder part of the back, where the hairs are more or less grizzled with white. The tail is not so bushy as that of the Tana. The aperture under the orbits is of an elongated oval form.

Sir Stamford Raffles, in his original account of this animal, describes it as being very lively and playful in its habits, and as feeding on fruits. He first saw it tame in the house of a gentleman in Penang, and states that this individual "was suffered to go about in perfect liberty, ranged in freedom over the whole house, and never failed to present himself on the breakfast and dinner table, where he partook of fruit and milk." Dr. Cantor, in his "Catalogue of the Mammalia inhabiting the Malayan Peninsula and Islands," gives the following interesting account of this Bangsring:—"The young of this very numerous species in hilly jungle," he says, "is easily found, and becomes familiar with its feeder, though towards strangers it retains its original mistrust, which, in mature age, is scarcely reclaimable. In a state of nature it lives singly or in pairs, fiercely attacking intruders of its own species. When several are confined together, they fight each other, or jointly attack and destroy the weakest. The natural food is mixed insectivorous and frugivorous. In confinement individuals may be fed exclusively on either, though preference is evinced for insects; and eggs, fish, and earth-worms are equally relished. A short, peculiar, tremulous whistling sound, often heard by calls and answers in the Malayan jungle, marks their pleasurable emotions; as, for instance, on the appearance of food; while the contrary is expressed by shrill protracted cries. Their disposition is very restless, and their great agility enables them to perform the most extraordinary bounds in all directions, in which exercise they spend the day, till night sends them to sleep in their rudely-constructed lairs in the highest branches of trees. At times they will sit on their haunches, holding their food between the fore-legs; and after feeding they smooth the head and face with both fore-paws, and lick the lips and palms. They are also fond of water, both to drink and to bathe in. The female usually produces one young." Dr. Cantor also states that "the lateral raised lines of the palms and soles, the posterior part of the first phalanges and the third phalanx, which is widened into a small soft disc; in fact, all the points which rest on the ground are studded with little transversely-curved ridges, or duplications, similar to those observed under the toes of some Geckotidæ [Wall-Lizards], which fully accounts for the precision with which these animals perform the most astounding leaps from below, barely touching with their soles the *point d'appui* above. In a cage," he adds, "the *Tupaia* will continue for hours vaulting from below, back downwards, poise itself for an instant, continuing back downwards under the horizontal roof, and regain the point of starting, and thus describe a circle, the diameter of which may be three or four times the length of the animal, in far shorter time than is required for the description."

Allied to the Ferruginous Bangsring, and of nearly the same size, are two species which must be referred to on account of their geographical distribution, which carries this type of animals much farther to the west than we should expect. These are Elliot's Bangsring (*T. Ellioti*), a species with unusually short and harsh fur, specimens of which have been obtained from Madras, Bengal, and Bombay; and Belanger's Bangsring (*T. Belangeri*), originally procured in Pegu, but which also occurs in Burmah and Sikkim.

Horsfield's Bangsring (*Tupaia javanica*) is a smaller animal than the preceding, an adult specimen measuring only about thirteen inches long, of which about one-half goes to the tail. The colour of its fur is greyish-brown, grizzled on the back, and with a whitish line on each shoulder. It inhabits Borneo, Sumatra, Java, and Arracan. The Little Bangsring (*T. minor*) is a still smaller species, measuring only five inches and one-third in length of body, but closely resembling the preceding in its characters. It is described by Dr. Günther from Bornean specimens. The Murine Bangsring (*T. murina*), which forms the genus *Dendrogale* of the late Dr. Gray, has also only been

* *Tupaia ferruginea*

found in Borneo. It is a small species allied to the preceding, but has the tail more rat-like, and clothed only with comparatively short hairs, those of the lower surface especially being very short.

LOW'S PTILOCERQUE.*

Besides the true Bangsrings forming the genus *Tupaia*, this family includes two other small animals, one of which, Low's Ptilocerque, is a very elegant little creature. The specimen originally described by Dr. Gray in 1848 was captured by Mr. Low in Rajah Brooke's house in Borneo. It has a rather shorter head than the true Bangsrings, but its dentition is nearly the same; the aperture under the orbit is round, and the circle of the bony orbit is not quite complete behind. The most distinctive character of the animal is, however, to be found in its tail, which is an exceedingly peculiar organ. The tail itself is long and slender, and instead of being thickly clothed with bushy hairs, as in the Bangsrings, it has the basal portion hairy; then a long piece naked, covered with rings of broad, square scales, among which there are only a few short, scattered hairs; and, finally, about a third of its length is furnished with long hairs arranged on the two sides of the tail, so as to produce the appearance of the two wings of a dart or arrow (see figure, p. 342).

The Ptilocerque, which is an inhabitant of Borneo and Sarawak, is between five and six inches long, with a tail rather longer than the body. Its general colour is blackish-brown above, minutely grizzled by the yellowish tips of the hairs; the lower parts and the cheeks are yellowish, and there is a black streak on each side of the face, enclosing the eyes. The tail is black, with the long hairs of the tip white, except a few towards the base. The habits of the animal are probably the same as those of the Tupaias.

THE SHORT-TAILED BANGSRING.†

A curious little animal belonging to this family was discovered in Sumatra by Dr. S. Müller. It has its muzzle produced into a long, movable snout, and the tail very short and naked. The skull is flatter than in the true Bangsrings; the orbit is incomplete; the sub-orbital aperture is in the form of a little fissure; and the dentition is different, there being six incisors in the upper as well as in the lower jaw, and four premolars on each side in both jaws. The total number of teeth is thus forty-four instead of thirty-eight. This animal has been found in Java and Sumatra.

The same, or a very nearly allied species, has been obtained in Pegu, and described by Mr. Blyth under the name of *Hylomys peguensis*. Professor Gill regards these animals as most nearly related to *Gymnura* in the family Erinaceidæ.

FAMILY III.—MACROSCELIDIDÆ, OR JUMPING SHREWS.

Some curious little creatures, peculiar to Africa and its islands, in which, as in the Jerboas and Kangaroos, the hind legs are more developed than the fore limbs, enabling the animals to advance in a biped fashion by a succession of leaps, are regarded by most zoologists as nearly related to the Bangsrings, in fact, both Professor Mivart and Mr. Gill make these two families form a distinct tribe of Insectivora. They both have the same kind of molar teeth, and the intestine furnished with a large cæcum. But whilst the Bangsrings are squirrel-like animals, with feet adapted for a life in trees, the Jumping Shrews are mouse-like creatures, of terrestrial jumping habits, and furnished with a long, thin, proboscis-like muzzle, which has procured for them the name of Elephant Shrews. They have large eyes, and ears of a moderate size and rather widely separated; their hind limbs are considerably elongated, especially the shank and the metatarsus, or portion forming the foot, which has a naked sole that is applied to the ground; the two bones of the shank (tibia and fibula), and in general those of the forearm (radius and ulna), are attached to each other at the lower end; and the first or inner toe is either placed further back than the others, or altogether deficient. The sides of the muzzle are usually furnished with very long whiskers. The tail is long, and more or less rat-like, but covered with short hairs.

In two of the three genera into which the family is divided the number of teeth is forty, namely,

* *Ptilocercus Lowii.* † *Hylomys suillus.*

on each side, incisors, $\frac{3}{3}$, canines, $\frac{1}{1}$, premolars, $\frac{3}{3}$, and molars, $\frac{3}{3}$, the incisors being small, and the upper canines furnished with two roots. In the exceptional genus *Rhynchocyon*, which includes only a single species, there is only one incisor in the upper jaw, and even this falls out as the animal grows old.

The species of this family are peculiar to Africa, where they are found in Algeria and Barbary, along the east coast, and at the Cape of Good Hope.

SOLE OF RIGHT HIND FOOT OF ELEPHANT SHREW. (*Natural Size*).

THE ELEPHANT SHREW.*

This appears to be the commonest species in Southern Africa, where its habits were observed by the late Sir Andrew Smith, who founded for it the genus *Macroscelides*. It is about five inches long, with a tail of about three inches, and its colour is a tawny brown, becoming whitish on the limbs. It is diurnal in its habits, and very active, hunting for its insect prey among the scanty herbage and stunted shrubs, which alone flourish in the dry rocky spots which it chooses for its place of habitation. It resides in burrows in

ELEPHANT SHREW (*Half Natural Size*).

the ground, and when disturbed immediately rushes to take shelter in its home, or under some neighbouring rock or stone.

Sir Andrew Smith described several other South African species, and at least one has been obtained on the Mozambique coast. In their structure and general habits they agree with the above-mentioned animal.

THE ALGERIAN JUMPING SHREW.†

Besides these southern species, however, the French naturalists have discovered a species of this genus in Algeria, and it is also found to inhabit Barbary. It is known to the French colonists in Algeria by the name of the "*Rat à trompe.*" This animal is of the same size as the preceding—that is to say, about five inches long; its tail measures four inches, and its long slender snout about half an inch. It has a soft tawny fur on the back and sides, and the lower surface is whitish. The Algerian Jumping Shrew is said to feed not only upon insects, but also upon vegetable matters. It is gentle and inoffensive, and may be easily tamed, when its gambols are said to be very sprightly and amusing.

* *Macroscelides typicus.* † *Macroscelides Rozeti.*

THE PETRODROME.*

The Mozambique coast produces another species of this family, agreeing with those just noticed in nearly all its characters, but of much larger size, and further distinguished from them by having only four toes on each hind foot. The first toe, which is pushed far back, and considerably reduced in size in the Elephant Shrews, is entirely deficient in the Petrodrome.

SOLE OF RIGHT HIND FOOT OF PETRODROME.

While the *Macroscelides* generally live in the plains, among grass and under bushes, the Petrodrome, as its name implies, prefers localities among the hills, where cavities and fissures in the rocks furnish it with a secure refuge. In three places where Professor Peters found it, this was the case. It lives on insects. In captivity it soon becomes familiar, although at first shy, but never inclined to bite. The natives at Tette call it *Sâro*.

THE RHYNCHOCYON.†

Besides the species of *Macroscelides* already mentioned, and the Petrodrome, the coast of Mozambique has another animal which is referred to this family, although it presents several characters which separate it very decidedly from all the rest. It was first described by Professor Peters under the name of *Rhynchocyon*, which means "beaked dog," although it must be confessed that there is nothing very dog-like about it. The name is in allusion to the large size of the canine teeth.

The Rhynchocyon, which is a very rare animal in collections, appears from the description and figure of Professor Peters to be a queer-looking beast. It measures about eight inches in length, exclusive of the tail, which is rather long, tapering, and rat-like, being covered with a ringed skin, and furnished with only a few scattered hairs. The muzzle is produced

THE RHYNCHOCYON (*Half Natural Size*).

into a very long movable snout. The fur is of a rusty-brown colour, with a blackish tinge about the ears and the back of the head, and some light reddish spots on the hinder part of the back.

This animal, which is called *Mutâu* by the natives, lives in holes in the ground, from which it

* *Petrodromus tetradactylus.* † *Rhynchocyon Cernei.*

issues at night in search of the insects on which it feeds, and is chiefly interesting to the zoologist for the structural characters which it presents. Thus, whilst agreeing with the ordinary members of the present family sufficiently to warrant its being classified with them, and to prevent its going anywhere else, it differs from them in some exceedingly important particulars, which might almost justify its being placed in a family by itself. Although the hind legs are more developed than the fore limbs, the disproportion between them is hardly so great as in the true Jumping Shrews; and further, all the feet are reduced to the same four-toed condition as the hind feet in the Petrodrome, and the outer toe is shorter than the rest. But it is in the dentition that the anomaly is the greatest. The Rhynchocyon never has more than one small incisor tooth on each side in the upper jaw, and even this drops out as the creature advances in age; and the upper canine is a simple tooth with a single root. In the lower jaw there are three incisors on each side, and in both jaws the canines are followed by three premolars and three molars. In the hind legs the two shank-bones are united near the extremity as in the preceding species, but the two bones of the fore-arm (radius and ulna) are separate.

FAMILY IV.—ERINACEIDÆ, OR HEDGEHOGS.

We pass now from groups of insect-eating animals the members of which must be sought in far distant countries, to a family represented in England by a very well-known species. Our Common Hedgehog, in fact, may serve as an excellent example of the family to which it belongs, although this certainly includes one species which presents rather anomalous characters.

All the Erinaceidæ have the two molar teeth broad, as in the preceding families; in fact, here the hinder ones are nearly square, and the tubercles forming their upper surface are rounded in form. The skull has a complete zygomatic arch, and the tympanic bone forms a bubble-like swelling on each side of the back of the skull. The back is clothed with hairs, among which there are a number of strong spines or bristles. The legs are short, and formed exclusively for walking, and the hind legs have the two bones of the shank (tibia and fibula) united. The intestine has no cæcum.

These animals are confined to the Old World, in nearly all parts of which some of the species are to be found. They feed chiefly upon insects and other small animals; most of them have the power of rolling themselves up into a ball, when the prickles with which the back is armed constitute a most formidable defensive armour; and in cold countries they pass the winter in a state of torpidity. Several fossil species have been found in Tertiary deposits in Europe.

THE HEDGEHOG.*

Our Common English Hedgehog may serve as the type of this family; all the species of which, with only a single exception, belong to the same genus, and present a very close resemblance to each other, both in appearance and habits. All the Hedgehogs, in fact, are small animals of robust form, with very short tails, and the greater part of the hairs of the upper surface converted into sharp spines. The muzzle is conical, and the jaws contain thirty-six teeth, twenty of which are in the upper and sixteen in the lower jaw (see figure, p. 343). The arrangement of these teeth is peculiar. There are three incisors on each side, of which the inner one is considerably larger than the rest, and in the upper jaw these are separated by a small space from the next tooth, which is generally regarded as a premolar, in which case the animals have no canines. Behind this, in the upper jaw, are three premolars, gradually increasing in size until the third has very much the appearance of a true molar, but furnished with a cutting edge; and then three molar teeth, two of which are large and broad, nearly square, and crowned with very strong tubercles, admirably adapted for crushing the hard skins of the insects on which the Hedgehogs principally feed. The hindmost molar is a small tooth. In the lower jaw the innermost incisor is very large, and projects almost horizontally forward, and it is followed by three small teeth, the nature of which has been a matter of dispute. Two of them, however, are generally considered to be incisors, and the third a premolar, but by M. F. Cuvier they were all described as premolars, making, with another and larger tooth which follows them, four premolars in the lower as in the upper jaw. This last premolar is a carnassial or cutting tooth, corresponding to that in the upper

* *Erinaceus europæus.*

jaw. It is separated by a small space from the last of the smaller anterior teeth, and is followed by three true molars, two of which are large, and furnished with four or five sharp tubercles, while the third is small, and shows only one strong point.

In the Common Hedgehog, as in most species of the genus *Erinaceus*, the feet are all composed of five toes; the legs are short, so that the animal runs along with its belly nearly touching the ground; the spines, with which the whole upper surface is covered, are hard, sharp, round, about an inch in length, of a dirty-white colour, with a dark-brown or nearly black ring a little above the middle; the nose is black, and the unspined parts of the body are clothed with coarse yellowish-white hair. The ears are small and rounded. The total length of the adult Hedgehog is usually about ten inches.

The Hedgehog inhabits the whole of Europe except Scandinavia and the north of Russia. It is found in the Caucasus, but does not appear to extend further into Asia. It lives both in the low country and in the mountains, ascending, in the Alps and Carpathians, to an elevation of above 6,000 feet. It may be met with in almost all situations, in forests, woods, fields, gardens, and orchards,

THE HEDGEHOG.

where it takes up its abode in thickets, in hedge-bottoms, and even in holes in walls. In such situations it passes its days in sleep, for it is, strictly speaking, a nocturnal animal, although on rare occasions it may be seen abroad in the day-time. In similar situations it passes the whole winter in a profound slumber, forming a nest for itself of moss or leaves, sometimes under the smaller growth of woods and gardens, sometimes in a hedge-bank, in the hollows and among the bare roots of trees, and in holes among rocks or in walls. The nest most commonly consists in whole or in part of withered leaves, which appear to be useful in keeping out the wet, and as the innermost leaves are impaled upon the animal's spines, it retains a thin coat of leaves when turned out of its winter-nest.

As the spring advances, the Hedgehog rouses itself from its long sleep, and proceeds to make up for the enforced abstinence from food which it has undergone for so many weeks. It comes forth in the evening, and runs about pretty quickly, but with a curious shuffling gait, in search of the insects and other small animals which constitute its usual prey. Insects, and particularly Beetles, appear to form the greater part of its diet, and its teeth are admirably adapted for pounding up the hard skins of these creatures. In consequence of their predilection for insect food, great numbers of Hedgehogs are brought to London and other great towns, to be kept in houses for the purpose of destroying the Cockroaches (Blackbeetles, as they are commonly called) which are such disagreeable inmates of most kitchens. In the pursuit of these insects the Hedgehog shows much activity, and Mr. Bell says that he has "seen a Hedgehog, in a London kitchen, push its way beneath a piece of carpet in all directions, and heard it at intervals crushing up the Cockroaches which it met with. In a short time it freed the place of these pests." Sometimes, however, this consummation is not quite so easily attained, and we

have heard of more than one instance in which the first Hedgehog brought into the house as a Beetle-killer actually died of overfeeding, and at least one other had to be procured before the plague of Cockroaches was got rid of.

Besides insects, the Hedgehog feeds on earthworms, slugs, and snails, and in destroying the latter it may certainly be regarded as a friend to the gardener. The consumption of earthworms is performed in a rather curious manner. These animals are seized when they are enjoying the damp freshness of the air out of their holes in summer evenings, and slowly passed into the mouth of their enemy from one end to the other apparently by the simple process of mastication with the molar teeth, the unconsumed portion of the worm being constantly transferred from one side of the mouth to the other, so that both sides of the jaw may come into play. This must be an unpleasant operation for the worm, much as its captor may enjoy it. It is uncertain whether the larger snails are eaten by the Hedgehog, no fragments of their shells having been found in the stomachs of specimens examined, but the smaller species, belonging to the genera *Vitrina* and *Zonitis*, certainly form a portion of its diet. Mr. Bell says that "the small Slug, *Limax agrestis*, is a favourite morsel with the Hedgehog, and is often scratched out and eaten in the summer months when concealed in the day in crevices, or amongst the roots of grass or other close herbage."

The Hedgehog does not, however, confine itself exclusively to the consumption of invertebrate prey; Frogs and Toads, Mice, and even Snakes, are not exempt from its attacks. Mr. Broderip many years ago published in the "Zoological Journal" an interesting account of an experiment made by Professor Buckland to ascertain how the Hedgehog deals with a prey apparently so formidable as a Snake. He says:—"The Professor procured a common Snake, and also a Hedgehog, and put them into a box together. Whether or not the former recognised its enemy was not apparent; it did not dart from the Hedgehog, but kept creeping gently round the box; the Hedgehog was rolled up, and did not appear to see the Snake. The Professor then laid the Hedgehog on the Snake, with that part of the ball where the head and tail meet downwards, and touching it. The Snake proceeded to crawl; the Hedgehog started, opened slightly, and seeing what was under it, gave the Snake a hard bite, and instantly rolled itself up again. It soon opened a second and again a third time, repeating the bite; and by the third bite the back of the Snake was broken. This done, the Hedgehog stood by the Snake's side, and passed the whole body of the Snake successively through its jaws, cracking it, and breaking the bones at intervals of half an inch or more, by which operation the Snake was rendered motionless. The Hedgehog then placed itself at the tip of the Snake's tail, and began to eat upwards, as one would eat a radish, without intermission, but slowly, till half the Snake was devoured. The following morning the remaining half was also completely eaten up." According to the statements of some observers, the Hedgehog will destroy not only the harmless common Snake, but also the Viper, and Professor Lenz has described in great detail the mode in which the Hedgehog disposes of this formidable antagonist. The strange part of his account is that the Hedgehog pursues the Viper for some time, smelling at it and licking it, and submitting to repeated bites from the venomous reptile before proceeding to extremities. It then kills the Viper by crushing its head, and proceeds to devour it from that end, without showing any signs of being injured by the poison of the Snake. This curious immunity is said to extend also to other poisons, some of which are at least doubtful; but it seems certain that the Hedgehog will devour the ordinary Blister Beetles (*Cantharides*) without inconvenience, although a very small dose of them would destroy much larger animals. Tschudi, however, has remarked that the acrid liquid secreted by the skin of Toads is disagreeable to the Hedgehog; in eating a Toad he rubs his muzzle on the ground after each bite.

From the narrow point of view of usefulness to man, we may up to this point have a very favourable opinion of the Hedgehog, but he has some other peculiarities which may perhaps be regarded as drawbacks. One of these is his attacking young game, and another his fondness for eggs. One of the editors of Bell's "British Quadrupeds" mentions an instance of the capture of a young Hare by a Hedgehog. A Hedgehog has also been caught in the act of worrying a young Rook which had fallen from the nest; and the general testimony of sportsmen and gamekeepers is to the effect that no small and young animals will come amiss to the Hedgehog. There is also no doubt that the Hedgehog will feed on the eggs of birds wherever it finds them; and it is even stated that it will make its way into a fowl-house, turn the hen off her eggs, and devour the latter.

The diet of the Hedgehog does not appear to be exclusively of an animal nature; in confinement it will feed readily on soaked bread and on cooked vegetables, and in a natural state it is said to eat the roots of plants and the fruits that fall from the trees in gardens and orchards. Gilbert White says:—"The manner in which they eat the roots of the plantain in my garden is very curious; with their upper mandible, which is much longer than their lower, they bore under the plant, and so eat the root off upwards, leaving the tuft of leaves untouched." Some writers have believed that the Hedgehog is so fond of fruit as actually to climb the trees, knock off apples and pears, and then throwing itself down upon them so that they may stick to its spines, walk off quietly with its booty to some quiet retreat. According to Ælian, the ancient Greek Hedgehogs played a somewhat similar trick with figs.

With all this, we have not quite done with the diet, real or supposed, of this curious little animal. It is a common belief in most parts of this country that the Hedgehogs will visit the Cows during the night and suck their milk, leaving but a scanty supply for the milkmaid in the morning. There seems, however, to be no satisfactory evidence of the commission of this crime.

When disturbed in its excursions the Hedgehog has the habit of rolling itself up into a ball, with the head and legs tucked carefully away under the belly, and the whole exposed surface completely enclosed by the spiny skin of the back. This is effected by the contraction of a most complicated system of cutaneous muscles, the most important of which, called the *orbicularis panniculi*, forming a broad band encircling the body, draws together the edges of the spiny part of the skin towards the centre of the ventral side of the body, thus forming a sort of prickly bag within which the whole body and limbs of the animal are enclosed. When thus arranged, by the action of the cutaneous muscles the whole of the spines of the upper surface are strongly and firmly erected, making a fence which suffices to protect the Hedgehog from the attacks of nearly all his enemies. Scarcely any Dogs can be found with pluck enough to make a successful attack upon a rolled-up Hedgehog, although it is said that some Dogs and Foxes have a trick by which to get at him, founded on the fact that a jet of water poured into the small aperture within which the head of the animal is concealed will cause him to unroll himself at once. The same power of contraction serves the Hedgehog in good stead in protecting him from other perils. If he finds himself falling down a precipice or from the top of a wall, or down a very steep slope, he immediately makes himself into a ball, and in this form will fall from very considerable heights (eighteen or twenty feet) without receiving the least injury; indeed, Hedgehogs have been observed more than once voluntarily to throw themselves down considerable distances, contracting in this fashion On reaching the bottom they simply opened themselves, and walked off none the worse for the fall.

The voice of the Hedgehog is a sound intermediate between a grunt and a squeak; Shakespeare, as is well known, calls it "whining." When kept in houses for destroying insects, it is said frequently to make itself disagreeable by its noise at night. In many places, both in this country and on the Continent, the Hedgehog is eaten, but chiefly, it is said, by gipsies and tramps. The mode of cooking adopted, we believe, is roasting the animal in his skin, and the flesh is generally said to be excellent. According to M. Cherblanc, the French gipsies envelop the Hedgehogs in a sort of paste of clay, and then cook them over the fire, turning them from time to time until the clay is quite dry and hard, when the roast is considered to be perfect. This earthen envelope is then broken and removed, carrying the spines with it.

Notwithstanding their formidable armour, the Hedgehogs have other enemies besides man. Dogs will attack them, but not often with success, unless we may believe in their employing the *ruse* already alluded to, which is also said to have suggested itself to the cunning mind of Reynard. But the Foxes are said to adopt another mode of dealing with their wished-for prey. When they meet with a rolled-up Hedgehog they will, it is said, roll him along till they come to some water, into which they drop the unfortunate little animal, and then seize him during his struggles to escape drowning. On the continent of Europe the Great Horned Owl or Eagle Owl (*Bubo maximus*) is described as an inveterate enemy of the Hedgehog.

The female Hedgehog goes with young about seven weeks. Before bringing her progeny into the world, she selects some more or less sheltered situation in a hedge-bottom or thicket, or sometimes in a corn-field, in which she constructs a nest of moss and leaves, so well put together, that even

when otherwise unprotected, its roof suffices to throw off the rain. The young, which vary in number from three to seven or eight, are, when first born, about three inches long, white, blind, and quite naked, except that they already possess the rudiments of their spines, which are then quite soft and flexible. In about four-and-twenty hours the spines have grown to a length of one-sixth of an inch, and acquired some hardness. The young animals, according to Gilbert White, have little hanging ears, and he adds that "they can in part draw their skin down over their faces, but are not able to contract themselves into a ball." In about a month the young have acquired nearly the colour of their parents, and are then taken out by the mother to feed, although she still suckles them for a time.

In captivity, if kindly treated, the Hedgehog soon becomes familiar. He takes readily to almost any diet, and, according to Dr. Ball, he will even partake of intoxicating liquors, which, curiously enough, seem to have the effect of making him immediately quite tame, after passing through a period of inebriety, during which his gestures and proceedings have a most ludicrous resemblance to those of a drunken man.

THE LONG-EARED HEDGEHOG.*

This species has the ears much larger and the muzzle longer than in the Common Hedgehog, and its legs also are longer and not so stout. The tail is very short. The spines, which are marked with from twenty to twenty-two little furrows, are white at the base, brown in the middle, and yellowish at the tip; the head is covered with hair of a dirty whitish colour; and on each side of the mouth there are four rows of long brown whiskers. This animal is only about two-thirds the size of the European Hedgehog. It is found in the western part of Asiatic Russia, especially about the Caspian, in Tartary, and Siberia. It does not occur in Persia, according to Mr. Blanford, although included by Schmarda in his list of the animals of Mesopotamia. It inhabits the province of Astrakhan, in south Russia, which makes it a European species. Very little is known of the habits of the Long-eared Hedgehog, but from that little it would appear to agree in most, if not all respects, with its European relative.

Several other species of Hedgehogs have been described, the majority of them from the Asiatic continent, reaching even to the district of the Amoor, from which Schrenck described one under the name of *Erinaceus amurensis*, which is supposed by Mr. Bell to be a variety of the Common Hedgehog. Mr. Blanford describes a peculiar Persian species with large ears and long spines (*E. macracanthus*), and Mr. Blyth another from Candahar (*E. megalotis*). Several Indian species are noticed by various authors, and some of these seem to be widely distributed, such as

THE COLLARED HEDGEHOG,†

whose range extends from Madras to Candahar and Afghanistan. It is about eight or nine inches long, and has the spines irregularly interwoven, ringed with white and black, with the tips yellow, or simply white and black, or black with a white ring in the middle; the ears, which are tolerably large, and the chin, are white; and the belly and legs pale brown.

Of this, and two other species observed by him in Candahar, Captain Hutton says:—"They are nocturnal, and during the day conceal themselves in holes, or in the tufts of high jungle grass. Their food consists of insects, chiefly of a small Beetle, which is abundant on the sandy tracts of Bhawalpore, and belongs to the genus *Blaps*. They also feed on Lizards and Snails. When touched they have the habit of suddenly jerking up the back with some force, so as to prick the fingers or mouth of the assailant, and at the same time emitting a blowing sound, not unlike the noise produced when blowing upon a flame with a pair of bellows." They have as complete a power of rolling themselves into a ball as the European Hedgehog.

One species of the genus, the Concolorous Hedgehog (*E. concolor*), appears to be peculiar to Asia Minor; others are found in Egypt, Algeria, the Sahara, and other parts of North Africa; and two are recorded from the Cape of Good Hope.

* *Erinaceus auritus.* † *Erinaceus collaris.*

THE BULAU.*

We shall find, as we advance with our examination of the Insectivorous Mammals, that the characters presented by these creatures, especially in their anatomical structure, are in many instances so curiously combined that it becomes a matter of considerable difficulty to decide to what particular family a given animal should be referred, the external and structural peculiarities often pointing in two different directions, but generally tending in a remarkable manner in these anomalous forms towards the great family of the Shrews, which may be regarded as the central types of the whole order. This is the case with the Bulau (*Gymnura Rafflesii*), a curious animal which was originally discovered in Sumatra by Sir Stamford Raffles, and described by him as a Civet, under the name of *Viverra gymnura*. Vigors and Horsfield in England, and Lesson in France, recognised its distinctness from the Civets, and formed it into a distinct genus under the name of *Gymnura*, designating the species after

THE BULAU.

its discoverer, and this name has been generally adopted, although De Blainville afterwards proposed to call the genus *Echinosorex*, and to retain Raffles' specific name.

De Blainville's name may be taken to express in general terms the peculiar characters of the animal, which is a Hedgehog-like Shrew, or a Shrew-like Hedgehog, the latter being the more correct term. The Bulau, as Professor Gervais says, is "a Hedgehog, with the body, and especially the head, more elongated than in those already described, with flexible hairs, and furnished with a tail which is nearly naked, and as long as the body." It has also a larger number of teeth, there being forty-four in all, namely, on each side, in each jaw, three incisors, one canine (that in the upper jaw with two roots), and seven premolars and molars which closely resemble those of the true Hedgehogs. On the back a few stiff bristles are mingled with the softer hairs, as if to give a sort of indication of the animal's relationship to the Hedgehogs; but it has no power of rolling itself up into a ball.

The Bulau has a long, round, tapering, scaly tail, almost like that of a Rat, but with a greater number of scattered stiff hairs among the scales. Its head is long, and its muzzle produced into a short proboscis. Its legs are rather short, and its feet, which are adapted to plantigrade progression, are furnished with five toes, each armed with a curved and pointed claw. The general colour of the body and limbs is black or greyish-black, with the head and neck pale or whitish, and with a black streak

* *Gymnura Rafflesii.*

11 1. TENDRAC. 2. TELFAIR'S TENDRAC. 3. TANREC.

over each eye; the tail is blackish at the base, whitish at the tip. The length of the Bulau is about twenty-six inches, of which the tail occupies twelve. Besides Sumatra, this curious animal, which may be regarded as a connecting link between the Hedgehogs and the Shrews, has been met with in the peninsula of Malacca, and in Borneo, and the neighbouring island of Sarawak. The specimens from Sarawak and the mainland of Borneo opposite Labuan are said by Dr. Günther to be all white, with only a portion of the longest and strongest hairs on the body black. Of the habits of the Bulau nothing appears to be recorded.

Professor Gill is inclined to place that almost equally curious animal, *Hylomys suillus* (see p. 350), in juxtaposition with the Bulau.

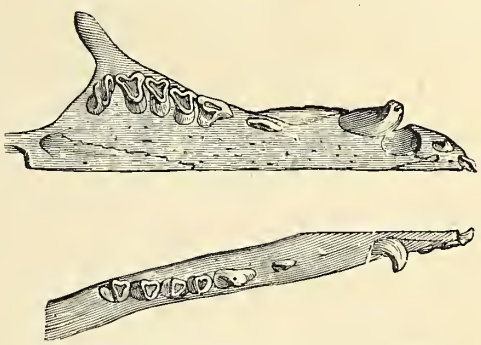
FAMILY V.—CENTETIDÆ, OR TANRECS.

The animals of this family usually have the back more or less armed with fine spines or bristles among the softer hair, the legs short, the feet five-toed, plantigrade, and the tail very short or altogether wanting, except in one anomalous genus. They are all furnished with external ears. The skull is rather elongated, approximately cylindrical, and has no zygomatic arches. The tympanic bone does not form a bubble-like protuberance; and the molar teeth are narrow, and form more or less regular triangular prisms. The number of teeth is variable. The clavicles (collar-bones) are well developed; the two bones of the shank (*tibia* and *fibula*) are separate; and the intestine has no cæcum.

With the single exception of the curious genus *Solenodon*, the position of which was long regarded as very doubtful, but which is now placed in this family, the Centetidæ are confined to the Madagascar region, which bears so many other peculiar types of animals. Their food appears to consist chiefly of worms and insects, but doubtless, like their relations the Hedgehogs, they will seize upon any small animal that comes in their way. The species are not numerous.

THE TANREC.*

The Tanrec, or Tangue, which is the best-known species of the family, is entirely destitute of tail. It has a long, pointed muzzle, small ears, and short legs; the five-toed feet are armed with strong claws, and the body is not capable of being contracted into a ball; the angle of the lower jaw is slightly bent inwards; and the teeth are forty in number, there being on each side, in each jaw, three incisors, one canine, three premolars, and three true molars. The canines, both above and below, are of exceedingly large size; those of the lower jaw are received into deep pits in the sides of the intermaxillary bone; while those of the upper jaw project downwards on each side of the lower jaw. These are the characters of the genus *Centetes*.



DENTITION OF TANREC. (*Twice Natural Size.*)

The Tanrec (see figure in the full-page illustration) measures about fifteen or sixteen inches in length, of which nearly one-third is made up by the elongated head. Its body is covered with a mixture of bristles, hairs, and more or less flexible spines, the latter being especially strong about the nape and sides of the neck, where they measure about one-fifth of an inch in length, and form a sort of crest or collar. The spines are longer and more flexible on the body, where they are mixed with bristles, which prevail especially on the back, and these measure sometimes as much as two inches long. The belly and limbs are clothed with short hair. All these dermal appendages are yellowish, with the middle brown, giving the animal a general tawny colour, which is paler or yellowish on the limbs. The face is brownish, and the long whiskers which spring from each side of the muzzle are of a dark brown colour. This is the general coloration of the species, which, however, varies occasionally. The young are said to be brown with yellow longitudinal streaks, which disappear with age.

* *Centetes ecaudatus.*

This animal occurs abundantly not only in Madagascar, but also in the small islands of Nossi-falie, Nossi-bé, and St. Marie, and it has been introduced into Mayotte, Réunion, and the Mauritius. It passes one-half of the year in a state of torpidity, and this not in the hot season, as has been supposed, but in the colder part of the year. About May or June the Tanrecs dig themselves holes, in which they sleep until December, with their heads comfortably tucked away between the hind legs. Their burrows are generally betrayed by the presence of a small heap of earth or moss thrown up at the entrance, and as the animals are at this time very fat, and regarded as great delicacies by the natives of Madagascar and the Creoles of Réunion, they are then pursued with great avidity. Their flesh is said by some people to be preferable to Sucking-pig; but others complain that it has a musky flavour. In Madagascar the inhabitants hunt the Tanrecs with Dogs trained expressly for the purpose.

The number destroyed for food seems to be very great; but the fecundity of the animal is such as to compensate even for this violent persecution. The female is said to produce from twelve to sixteen young at a birth, and she is described as taking the greatest care of her progeny. As soon as the young Tanrecs can run about, she takes them with her in search of food, and will then defend them bravely against every danger, allowing herself to be killed rather than be separated from her family.

The Tanrecs—or Tangues, as they are called by M. Pollen—live chiefly in the mountains, in places covered with mosses, ferns, and bushes. Their food consists principally of earthworms, which they rout out by means of their feet and pointed snouts, using the latter after the fashion of a Pig. Insects also form a part of their diet; and, like the Hedgehog, they are said to feed upon certain fruits and roots. In captivity they will eat raw meat, and are also said to be fond of bananas. Their habits are nocturnal; they sleep nearly all the day, and come forth in full activity only at night.

Several other supposed species of this genus have been described, but only one of them appears to be really distinct, namely, the Streaked Tanrec (*C. semispinosus*), which is described as about the size of a Mole, and streaked with black and yellow. It also inhabits Madagascar. It forms the genus *Hemicentetes* of Professor Mivart.

THE TENDRAC.*

An animal much more like a Hedgehog than the preceding, having the body covered with spines almost as formidable as those of the Common Hedgehog, and also possessing the power of rolling itself into a ball, is the Tendrac of Madagascar (see figure in the full-page illustration). It has been formed into a separate genus (*Ericulus*), distinguished by the above peculiarities, by the presence of only two pairs of incisor teeth in each jaw, by its canine teeth possessing two roots and a second small cusp to the crown, and by its possession of a short tail like that of the Hedgehog. The total number of teeth is thirty-six. The Tendrac is about one-third less than our Common Hedgehog, which it closely resembles in appearance, and in the form of its muzzle, ears, tail, and feet. Its general tint is blackish, its spines being black, with the tips white or reddish. In its habits it resembles the Tanrec.

Telfair's Tendrac (*Echinops Telfairi*) is another little Hedgehog-like inhabitant of Madagascar, where, according to Mr. Telfair, its discoverer, it goes by the native name of *Sokinah* (see figure in the full-page illustration). In its general characters it closely resembles *Ericulus*, but has only two premolars on each side in each jaw, and the two intermediate upper incisors are much longer than the others. It is the only known species of its genus. Its length is about five inches; it has a short pointed snout, a very short tail, and ears of moderate size, and rounded; its colour above is brownish, and beneath dingy white, and the upper surface is thickly covered with sharp spines, which are whitish at the base, and chestnut brown at the tips. All the feet are five-toed.

THE RICE TENDRAC.†

In 1870, M. Grandidier described a small Tendrac which he had obtained at Ankaye and Antsianak in Madagascar, and which he says inflicts enormous injury upon the rice-crops, by burrowing in the earth, and rooting up the young plants. The native name, "valavou fontsi," is said

* *Ericulus spinosus.* † *Oryzorictes hova.*

to refer to this destructive habit of the animal, and, we presume, has the same meaning as the name given by M. Grandidier to the genus which he established for it.

The Rice Tendrac has the snout produced into a short trunk, at the extremity of which the nostrils are situated. The eyes are very small, and the ears rounded and of moderate size. The teeth are forty in number, as in the Tanrec. The animal is plantigrade; the hind feet have five, and the fore feet four toes, and those of the latter are armed with very strong curved claws, which are doubtless of great service in the burrowing operations alluded to above.

The Rice Tendrac is of a greyish-brown colour. Its tail is short, clothed with long hairs at the base, but naked in the last two thirds, which exhibit a ringed appearance. It must be abundant in Madagascar, but M. Grandidier records nothing of its habits beyond the charge he makes of injury to the rice-crops. This is no doubt effected by the animal when burrowing in pursuit of insects and worms.

THE EARED EARTH SHREW.*

The curious series of animals included under the family Centetidæ is united in a remarkable manner by the intervention of a little creature about the size of a Mouse, discovered in Madagascar, and described by MM. A. Milne-Edwards and Grandidier under the name of *Geogale aurita*. At the first glance it might be taken for a true Shrew. It has a long head, although the snout is not prolonged, the nostrils open at the sides of the nose; the mouth is large, the ears are of large size, membranous, and naked, and apparently capable of folding up at the will of the animal so as to close the aperture of the ear, and the tail, which is shorter than the body, is covered with a finely-ringed skin, over which are scattered very short brownish hairs. These characters, as is remarked by the describers, give the animal somewhat the aspect of a little Opossum. The teeth are thirty-four in number; there appear to be six incisors in each jaw; the canines are very small, and the molars especially resemble those of *Solenodon*.

This little animal has the upper part of the body and head rather thinly covered with short greyish hairs, and the lower parts greyish-white. The sides of the muzzle bear long, brownish moustaches. Specimens were obtained in two localities in Madagascar (Mouroundava and Tullear), and in both cases they were found in the ground disturbed by pulling up the posts of a palisade, so that it may be inferred that this species hunts worms and larvæ in the earth, an operation in which the faculty of folding the external ears over their orifice would certainly be useful to it.

THE AGOUTA.†

Forty-four years ago (in 1833) Professor Brandt, of St. Petersburg, described a singular animal from St. Domingo, which was particularly interesting, both as being the only known representative of the Insectivorous Mammalia in the tropical regions of America, and also on account of its own extraordinary character. It was an animal of about the size of a small Rabbit, the head and body measuring about a foot in length, but the muzzle was drawn out into a sort of trunk or proboscis, at the sides of which, near the tip, the nostrils were situated; the body terminated behind in a naked, rat-like tail, rather more than eight inches in length; whilst the feet, which were decidedly plantigrade, and each furnished with five toes, had the latter armed with curved, compressed claws of formidable dimensions, especially on the fore feet. The dentition clearly showed the animal to be insectivorous, but its characters were so peculiar that Brandt seems to have regarded it as a sort of intermediate form between the Shrews and the Marsupial Opossums.

Subsequent investigations have shown that, odd as this animal may be, its place is undoubtedly among the true Insectivora; and Professor Peters, of Berlin, by a consideration of its characters, and especially of those of the skeleton, arrived at the conclusion that it is most nearly related to the Tanrecs of Madagascar, widely separated as that land is from the West Indian home of the Agouta.

Professor Brandt established a distinct genus for the reception of the animal described by him which he called *Solenodon paradoxus*—the generic name referring to the peculiar channelled structure of

* *Geogale aurita.* † *Solenodon paradoxus.*

the outer incisors in the lower jaw—the specific name to the paradoxical nature of the animal itself Professor Peters' interpretation of the dentition, which was long a subject of doubt, is now generally accepted, and according to this, there are in the front of the upper jaw two large, acute incisors, with a smaller one placed a little further back on each side; and in the middle of the lower jaw two very small incisors, with immediately on each side of them one of the large canine-like teeth, with a deep groove or channel on the inner surface, which have already been alluded to. Behind these teeth come in each jaw a canine, four premolars, and three true molars, so that the dental formula, according to this view, is—incisors, $\frac{1-2-1}{4}$, canines, $\frac{1-1}{1-1}$, premolars, $\frac{4-4}{4-4}$, and molars, $\frac{3-3}{3-3}$, making forty teeth in all.

The premaxillary bones extend some little distance in front of the roots of the upper incisor teeth, but the nose itself is prolonged considerably beyond them, forming a long, slender proboscis. The eyes are small, and the ears of moderate size, and rounded; the body is covered with rather stiff hairs, which, however, leave the hinder part, from the root of the tail downwards, almost naked; the tail is

THE AGOUTA.

long, tapering, and ringed, with a few scattered, very short hairs; the legs are of moderate length, and the feet, all of which have five toes, are nearly naked, or covered only with short hair.

The Agouta, or *Solenodon* of St. Domingo, has the face, head, and upper parts brown, becoming blackish behind and on the thighs; the sides of the head and neck lighter brown, with a mixture of red and grey; the belly and feet tawny brown; the breast bright rust colour; and the tail greyish towards the base, and white towards the tip.

Of the habits of this animal, long supposed to be the only species of its genus, nothing is recorded; but its teeth very clearly indicate a carnivorous or insectivorous diet, and its habits, in all probability, resemble those of the following species.

THE ALMIQUI.*

In 1838, or nearly four years after the publication of Professor Brandt's description of the preceding animal, Professor Poey, of Havana, detected the existence of a *Solenodon* in some of the mountainous parts of the island of Cuba. He identified it with Brandt's species, and noticed it under

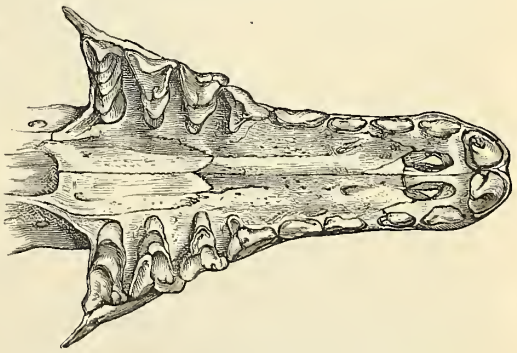
* *Solenodon cubanus.*

the name of *Solenodon paradoxus*, in his "Natural History of Cuba," which appeared in 1851. Later, however, Professor Peters, having procured a specimen from Cuba, and compared it with the one from St. Domingo in the museum at St. Petersburg, found that the two animals were quite distinct, and described the Almiqui of Professor Poey under the name of *Solenodon cubanus*.

The Cuban animal is of nearly the same size as that from St. Domingo, measuring in a straight line from the point of the nose to the root of the tail a little more than eleven inches. Of this the head makes about $4\frac{2}{3}$ inches. The stout, scaly tail is $7\frac{3}{5}$ inches in length. The hairs of the general surface of the body are very long, and form a sort of cloak for the animal, leaving its hinder part bare in a very singular manner. The colours are rather different in the Cuban species. The whole of the head, the neck, the chest, and the sides of the belly are tawny or yellowish, and the rest of the body, a streak on the nape of the neck, and another in the middle of the belly, are brown or blackish-brown. The legs are clothed with hair like that on the body, but shorter; and the upper surface of the feet has a scanty covering of short hairs which allow the skin to appear through them, and even this ceases towards the extremities of the toes. The teats in both species are situated on the groin.

The Cuban *Solenodon* is found in the mountains near Trinidad and Bayamo, in the southern and western parts of the island of Cuba. It is a nocturnal animal, coming forth late in the afternoon or in the evening, and amusing itself with various gambols during the night. It appears to be a predaceous animal, and in captivity shows signs of great excitement when a fowl or other animal passes by its cage. According to one observer, it will tear a chicken to pieces in a moment with its strong claws. At sight of a possible prey the long hair of its body stands on end. When sleeping during the day it seeks some corner in which it can stow away its head, and seems then to think that it is in a place of security, for when pursued it takes refuge in a shelter of the same kind, and will remain there until it is captured by seizing its tail. When disturbed in its repose it expresses its displeasure by grunting; and its ordinary voice, which is said to be very penetrating, is described as something between the grunt of a Pig and the cry of a bird. When enjoying itself at night it sometimes hoots like an Owl.

The occurrence of these two animals in the large West Indian islands is an exceedingly remarkable fact in the geographical distribution of animals, when we consider that in the general opinion of zoologists their nearest relations are the Tanrecs of Madagascar, and the *Potamogale* or River Shrew of some West African rivers. Professor Peters indeed remarks that the circumstance is the less surprising, as a certain type of Iguanidæ, otherwise peculiar to America, is represented in Madagascar, where also are found species belonging to two American genera of Snakes. But this does not explain the phenomenon. Mr. Andrew Murray maintains that the relationship of *Solenodon* is rather with the Shrews than with the present family, and, in fact, that they are peculiar and gigantic Shrews, which would certainly lessen the difficulty, seeing that there are plenty of Shrews in North America; but his arguments are by no means conclusive. Mr. Wallace, alluding to the occurrence in Europe of fossil remains referred to the Centetidæ, regards this as a case of a type formerly very widely distributed being now broken up, and represented only at or near the two extremities of its greatest range.



UPPER JAW OF WEST AFRICAN RIVER SHREW.
(*Twice Natural Size.* From *Trans. Zool. Soc.*).

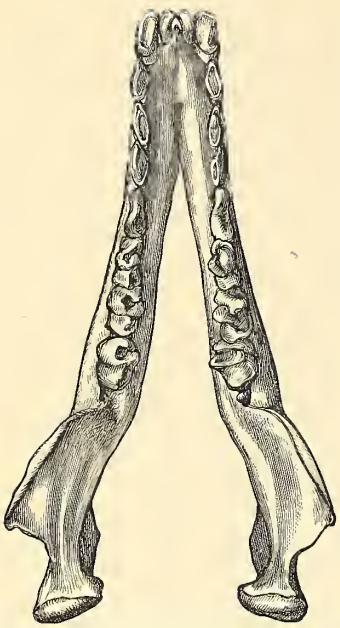
FAMILY VI.—POTAMOGALIDÆ.

This family includes only a single species, so that its characters may be indicated as part of the description of the animal itself, namely:—

THE WEST AFRICAN RIVER SHREW.*

This was originally described by its discoverer, M. Du Chaillu, as a Carnivore, under the name of *Cynogale velox*, but as its characters were very doubtful, the name *Potamogale* was suggested for it in

* *Potamogale velox.*



LOWER JAW OF WEST AFRICAN RIVER SHREW. (*Twice Nat. Size.* From *Trans. Zool. Soc.*).

case of its proving to belong to a distinct genus. The late Dr. Gray described it as a Rodent under the name of *Mythomys*. Some years later Professor Allman and Professor Barboza du Bocage procured perfect specimens, and proved the animal to belong to the Insectivora, the latter naturalist describing it under the new name of *Bayonia velox*. Thus within a few years it received no less than three different names.

When the Insectivorous nature of Du Chaillu's River Shrew was ascertained, it was found to be most nearly allied to the Centetidæ or Tanrecs, with special affinities to the West Indian Solenodons. It is, however, generally regarded as constituting a distinct family, characterised among other things by the less cylindrical skull, the absence of clavicles, the union of the two bones of the shank towards the extremity, the presence of anal glands, and the compressed form of the tail. The teeth, as in the true Tanrecs, are forty in number, but the molars differ considerably in form, as will be seen from the annexed figures.

This little beast, that has given rise to so much discussion among zoologists, and received so many names, is only a little larger than our common Stoat, measuring about nine inches in length, exclusive of the powerful tail, which is of about the same length. In its appearance it very much reminds one of a miniature Otter, from which, however, it differs considerably in the form of the head, which terminates

THE WEST AFRICAN RIVER SHREW. (*Half Natural Size.* From the *Transactions of the Zoological Society.*)

in a broad flattened muzzle, having its sides furnished with a most luxuriant crop of stiff bristle-like whiskers. The hair of the upper part of the body and limbs is brown and soft, although rather coarse,

and that of the lower surface yellowish; and the coat consists of two kinds of hairs, namely, an inner coat of very fine short silky hairs, through which longer hairs of a very peculiar structure project. These long hairs are very thin at the bulb, and increase very gradually in thickness for about one-third of their length, when they suddenly contract a little, and then expand into a flat lance-shaped blade, which terminates in a very fine point. This coarser fur covers the whole body, the thick root of the tail, and the upper part of the limbs; the rest of the tail, the under side of the muzzle, and the upper surface of the feet are clothed with short, close hairs. The ears are of moderate size, the eyes very small, and the toes on all the feet five in number, armed with small sharp claws, and without webs, but the second and third toes on the hind feet are united as far as the end of the first phalanx.

The most remarkable peculiarity of the animal is its tail, which presents a most unusual development for an Insectivorous Mammal. Professor Allman says, "It is so thick at its base that the trunk seems uninterruptedly continued into it; but it soon becomes laterally compressed, and then grows gradually thinner and narrower towards the tip. . . . . Its lower edge is rounded, and its upper is continued into a membranous crest about one-eighth of an inch in height, and clothed with the same short, stiff, appressed hairs" as the rest of the tail.

This great development of the tail might of itself convince us that this organ is of great service to its owner, and such, from the account of the habits of the animal given by its discoverer, is evidently the case. M. Du Chaillu says:—"This extraordinary animal is found in the mountains of the interior, or in the hilly country explored by me north and south of the equator. It is found along the water-courses of limpid and clear streams, where fish are abundant. It hides under rocks along these streams, lying in wait for fish. It swims through the water with a rapidity which astonished me; before the fish has time to move it is caught. On account of the rapidity of its movements, I have given it the specific name of *velox*. The animal returns to land with its prey almost as rapidly as it started from its place of concealment. The great motive power of the animal in the water seems to be in its tail."

CHAPTER II.

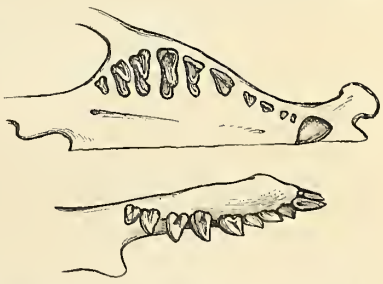
GOLDEN MOLES—MOLES—DESMANS—SHREWS.

General Description of the Golden Mole Family—Their Points of difference from the True Mole—THE CAPE GOLDEN MOLE—Its Varieties—The Family of True Moles—THE COMMON MOLE—Described—Distribution—Teeth—Fore-limbs—Breast-bone—Not a Miserable Creature—Extreme Voracity—Diet—His Blindness a Popular Error—A Thirsty Soul—His Fortress—The Roads leading to it—Speed of a Frightened Mole—"Mole-hills"—A-wooing—His Strong Family Affections—His Persecution a Doubtful Benefit—THE BLIND MOLE—Several Allied Species—THE STAR-NOSED MOLE—Its Snout—THE COMMON SHREW MOLE—Other Species in the United States—The Family of Desmans—THE DESMAN—Its Otter-like Habits—Its Trunk—THE PYRENEAN DESMAN—THE HAIRY-TAILED MOLE-SHREW—The Family of Shrews—THE COMMON SHREW—Or Shrew-Mouse—Superstitions about it—DEKAY'S SHREW—THE GARDEN SHREW—THE TUSCAN SHREW—THE RAT-TAILED SHREW—THE WATER SHREW—Essentially Aquatic—Its Prey—Allied Species—THE TIBETAN WATER SHREW—THE TAILLESS SHREW—Concluding Remarks—Classification—Distribution—Affinities.

FAMILY VII.—CHRYSOCHLORIDÆ, OR GOLDEN MOLES.

A FEW species of Insectivora, which, in their general form and habits more or less resemble our Common Moles, but differ from them in several important points of structure, form the family of the Chrysochloridæ, or Golden Moles. They are peculiar to the southern and eastern parts of Africa, ranging from the Cape to the Mozambique Coast.

SKULL OF GOLDEN MOLE. (*Nat. Size.*)

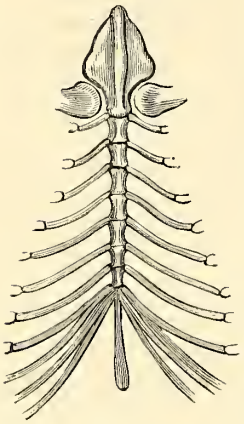


DENTITION OF GOLDEN MOLE. (*Enlarged.*)

These animals have a cylindrical body, clothed with a fine, close fur, usually exhibiting a metallic lustre which has been compared to that presented by the feathers of some of the most brilliant birds. They have a conical head, short limbs, a very short, almost rudimentary tail, minute eyes, actually covered by the skin, and no external ears. From the form of the body, the texture of the hair, and the structure of the limbs, they are as evidently organised for burrowing underground as the Moles, with which they have generally been

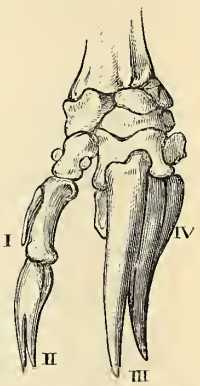
associated; but the structure of the mechanism by which their burrowing is effected is so different that, taken in conjunction with certain other characters, it has led modern zoologists to regard the Golden Moles, notwithstanding their scanty numbers, as constituting a perfectly distinct family of the Insectivora.

The skull is shorter, more wedge-shaped, and more elevated at the back than in the true Moles, and the premaxillary bones form a process which is curiously turned outwards (see figure, p. 365), but this does not run to the extremity of the snout, which is supported by cartilages. The dentition is very peculiar. The total number of teeth is either thirty-six or forty, one species having two molars less in each jaw than the others; the front upper pair are large and pyramidal in form, presenting some resemblance to the corresponding teeth in the Desmans; these are followed on each side by three minute teeth, and these again by five or six true molars, of prismatic form. In the lower jaw there are two pairs of front teeth, followed on each side by three small pointed teeth (premolars), and by four or five true molars.



STERNUM OF GOLDEN MOLE.
(*Twice Natural Size.*)

The structure of the anterior limb, and of the parts which support it, is peculiar and characteristic, differing materially from that which obtains in the true Moles. In the sternum there are seven similar pieces, which receive the extremities of ribs, and behind these a semi-cartilaginous piece, called the ensiform (or sword-like) appendage. In front of the rib-receiving pieces is a large bone (the *manubrium*), excavated on each side behind to receive the ends of the collar-bones, and furnished along its lower surface with a ridge serving for the attachment of a part of the powerful muscles by which the fore limbs are moved. The form of this part is very different from that of the corresponding piece in the Mole (see p. 368). The form and mode of articulation of the collar-bones (clavicles) is also very different. In the True Moles the clavicle is a short, thick bone, almost resembling the vertebra of a fish; in the Golden Moles it is a longer and more slender bone, of ordinary form, and articulated after an ordinary fashion, both with the sternum and the shoulder-blade. The latter bone is larger than in the Mole, and has a very strong spine, which projects far beyond the articulation of the humerus (arm-bone). The humerus itself is a more slender bone than in the Mole, and more of the ordinary form, although it has a very strong tuberosity near the lower extremity; and one of the carpal bones (the pisiform) is most unusually developed, passing up alongside of the bones of the fore-arm (radius and ulna), until it reaches the humerus. The fore foot is quite different in its construction from that of the Mole. The latter consists of five toes, armed with large flat claws, and forms a shovel-like organ, turned outwards in a peculiar manner. The fore foot of the Golden Mole has only four digits, of which the inner and outer ones (I. and IV. in figure) are small, while the second and third toes (II. and III.) are large and armed with very large claws; the claw-joint of the third, especially, being of enormous size, and cleft nearly to its base. With this powerful instrument the Golden Mole digs his way very readily through the ground, using his hind feet, which have five toes, and much resemble those of ordinary Moles, to push him forward in his burrows.



FORE-FOOT OF GOLDEN MOLE.
(*Enlarged. After Owen.*)

THE CAPE GOLDEN MOLE.*

The Cape Golden Mole is about the size of our Common Mole, or a little more than five inches in length. The colour of its fur is brown, but according as the light falls upon it it shows brilliant golden and iridescent green and purple reflections; a patch round the eye and a streak from the eye to the angle of the mouth are yellowish-brown; and the throat has a greenish tinge. The claws are of a light brown colour.

The Golden Mole inhabits the Cape of Good Hope and Caffraria, where it feeds, like our British Mole, upon insects and worms, which it captures by burrowing through the ground. In the settled districts it is as much disliked as the Mole in Europe, on account of the damage which it does in fields

* *Chrysochloris capensis.*

and gardens by its subterranean activity. Several South African forms, nearly related to the above, but differing more or less in the colour and texture of the hair, have been described as distinct species by various zoologists; but these are now regarded as mere varieties of *Chrysochloris capensis*, which has also received the names of *aurea* and *inaurata*. Besides these, Dr. Günther has described a species from Caffraria, under the name of *C. Trevelyani*, which has the fur brownish and not lustrous, and also presents some minor differences of structure. The Blunt-nosed Golden Mole (*C. obtusirostris*) of Professor Peters, from Mozambique and Caffraria, which has a lustrous coat, has one molar less on either side in each jaw, so that the whole number of teeth is only thirty-six, and hence, and from some peculiarities in the structure of the lower molars, and the absence of a bladder-like enlargement in the temporal fossa, which occurs in the other species, Professor Mivart has placed it in a distinct genus, under the name of *Chalcochloris*.

FAMILY VIII.—TALPIDÆ, OR MOLES.

The True Moles constitute a very distinct family of Insectivora, characterised more especially by their complete organisation for a subterranean life. They have a more or less cylindrical body, with short limbs, of which the front pair are converted into most powerful digging organs, the construction of which will be noticed in the description of our common British species. The head is small, with the muzzle produced and generally pointed, and the eyes and ears concealed, the former being generally almost covered by a membrane; the skull is elongated, rather flat, with a distinct, thin zygomatic arch; the bones of the shank (*tibia* and *fibula*) are united; the wrist has a sickle-shaped bone on the inside, which passes to and helps to support the first digit; and the intestine has no cæcum. The teeth vary somewhat in number.

The Moles usually form a subterranean dwelling which exhibits considerable ingenuity in its construction, and live upon worms, the larvæ of insects, and other small animals which they capture whilst making their way beneath the surface of the ground. They inhabit the northern half of both hemispheres, not a single species being known to occur south of the Equator. The best known species, whose history may serve as a type of that of the family, is

THE COMMON MOLE.*

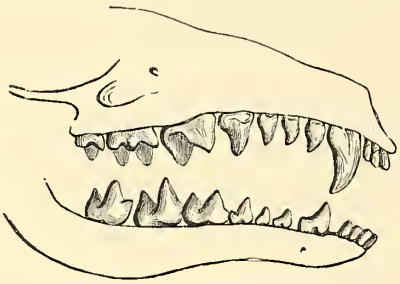
The Common Mole of this country, although an animal not very often seen, is yet so well known as regards its general appearance that we need hardly describe it. It has a plump, nearly cylindrical body, with very short limbs, a short tail, and a long, pointed muzzle. The eyes are so minute as to escape observation; the external ears are wanting; the body is covered with a velvet-like coat of hairs of a black or blackish-brown colour, with more or less of a whitish tinge in certain lights; and the feet, which are naked, are flesh-coloured. The total length of the animal is usually about six inches, of which not more than half an inch is made up by the tail.

THE COMMON MOLE.

The Common Mole occurs not only in the British Islands, but across the whole of the central and southern parts of the continent of Europe, extending northwards as far as the southern shore of the Baltic and throughout Denmark, thus justifying Shakspere's allusion to it in "Hamlet." It also stretches

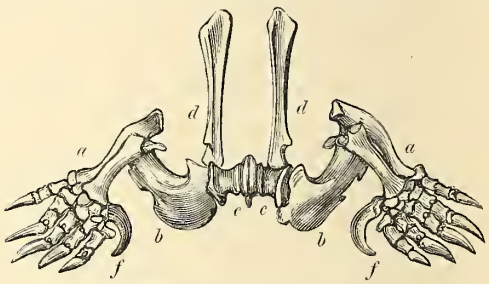
* *Talpa europæa.*

across Central Asia to the confines of China, and according to some writers extends through Persia into India. It is subject to much variation, which may be due to differences of soil or climate. Thus Mr. Bell records Moles "of a deep black colour, of a mouse-grey, dark olive-brown, pied, yellowish-white, and wholly or partially orange;" and mentions specimens from Berne "of the usual dark colour, but having a well-defined lozenge-shaped patch of orange on the breast."



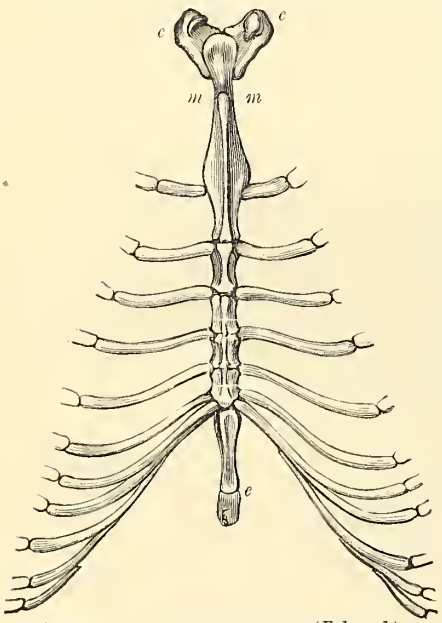
DENTITION OF COMMON MOLE.
(*Thrice Natural Size.*)

The Common Mole is the type of the restricted genus *Talpa*, the species of which are entirely confined to Europe and Asia. In these animals the elongated muzzle projects considerably beyond the opening of the mouth, and contains a pair of long tubular nostrils; it is supported by cartilage, and further strengthened by a small bone at the extreme tip. The teeth with which the jaws are armed are of formidable character, and plainly indicate the predaceous habits of the animal. There are always three true molars on each side in each jaw, and these are armed with several strong points united by ridges, but the number of the other teeth is slightly variable (the total number of teeth ranging between forty and forty-four), and even the determination of their precise nature is somewhat obscure. The dentition of the Common Mole (see figure) is now, however, generally regarded as follows: In the upper jaw, on each side, three incisors, one large canine provided with two roots, and four premolars, of which the hindmost is of large size; in the lower jaw, on each side, four incisor-like teeth, the hindmost of which is probably a canine, and four premolars, the foremost of which is very like a canine. The variation in number is caused by the absence of some of the premolars and incisors of the lower jaw.



FORE-LIMBS OF COMMON MOLE.

The structure of the fore-limbs, and the bones supporting them, in the Mole and its allies, is not only to be regarded as their most distinctive character, but also as furnishing a most striking example of the adaptation of means to ends. The Moles are condemned to live almost constantly underground, and their very existence depends on the facility with which they can make their way through the earth. The fore-feet, by means of which they dig, are accordingly converted into strong, broad, shovel-like organs, armed with broad, flat claws. The five toes of which these feet are composed consist each of two short joints and a long one, the latter making nearly half the length of the organ; and these long joints, which support the claws, are cleft at the tip and grooved underneath to receive an internal process of the nail, which serves to add to its strength and firmness. The bones of the wrist are short and firmly packed together, and from the scaphoid bone springs a long curved falciform bone (*f* in figure), which runs from the wrist to the first toe, which it helps materially to stiffen and support. The arm which supports this powerful hand is also of peculiar construction. In the forearm (*a*) the radius and ulna are distinct, but the acromion (or elbow) process of the latter is very long, and widened at the extremity, giving great power to the action of the limb. The humerus (*b*) is quite different from anything to be met with elsewhere in the Mammalia, being a short and very stout bone, rendered most irregular in its outline by the development of great crests and processes. It not only



STERNUM OF COMMON MOLE. (*Enlarged.*)

articulates with the shoulder-blade, but has a separate surface for the reception of the extremity of the collar-bone (*c*), which is a short bone resembling the vertebra of a fish. The shoulder-blade (*d*) is long and narrow, but stout and triangular in its form.

The sternum, or breast-bone, upon which all these parts rest, is scarcely less singular in its structure (see figure). The body of the sternum consists of four short pieces, which receive the ends of the ribs. Behind these is a slender ensiform process (*e*), and in front of them a manubrium (*m*), or presternum, of peculiar form, and quite as long as the whole middle part of the sternum. This part is widened in part of its length, receives a single pair of ribs in its hinder division, has a strong keel for the attachment of the pectoral muscles along its lower surface, and is much thickened at its front extremity, to the sides of which the collar-bones (*c*) are articulated. By this arrangement the whole fore-limb is thrown forward close to the head, and placed in the most favourable position for facilitating the burrowing operations of the animal, which are effected by bringing forward the fore-feet to the level of the nose, and then separating them and pushing backward, with an action that might almost be styled *swimming* through the ground. The hind feet, which are much smaller than those just described, are perfectly plantigrade in their structure. They also contain five toes, armed with small sharp claws, and are used only for the purpose of progression.

When we consider the structure of the Mole, and its perfect adaptation to its mode of life, we may agree with Mr. Bell in the belief that although superficial observers may regard it as a miserable creature, such a notion is an absolute mistake. It is true that the Mole, like so many of our own race, is condemned to almost perpetual exertion; but in the case of human beings we find that physical exertion at any rate is of itself so little of an absolute evil that many of our favourite amusements involve no small amount of it, and moral writers are rather fond of dwelling on the pleasure of earning one's dinner before eating it. Now this is no more than our friend the Mole has to do, so that he can hardly be looked upon as an object either of pity or contempt; and in fact, in his own quiet way, he probably manages to enjoy his life as much as his neighbours. In going about in his subterranean galleries the Mole is constantly engaged in looking out for suitable food, a very large supply of which is necessary for his comfortable existence. M. Geoffroy St. Hilaire says that the appetite of hunger in the Mole is a sort of frenzy, the animal when in view of its prey becoming violently agitated, and throwing itself on its victim as if maddened with rage. Vegetable substances constitute no part of its diet, although it is said sometimes to gnaw the roots of plants in search of the insects and larvæ which feed upon them. Its favourite food consists of earth-worms, in pursuit of which it sometimes comes to the surface so eagerly as to throw itself out of its burrow. It is in search of these animals, and especially of the larvæ of various insects which feed upon the roots of grasses and other plants, that the Mole makes its most superficial galleries.

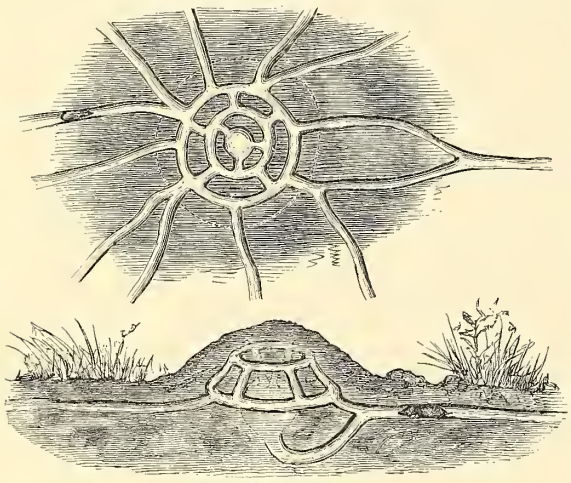
The Mole appears not to be particular in its tastes in the matter of food, and will readily make a meal upon animals much larger and higher in the scale of organisation than those above mentioned, should they happen to come in its way. Mice, small birds, Lizards, and Frogs, if placed within its reach, it will seize and hold with the ferocity and tenacity of a thoroughbred Bull-dog, and even weaker individuals of its own species are killed and devoured. According to M. Geoffroy, in attacking birds it makes use of a good deal of stratagem to get unobserved within reach of its prey, and then by a sudden and violent attack seizes the bird by the belly, tears it open with its powerful claws, and thrusts its muzzle among the unfortunate creature's entrails, with every appearance of intense enjoyment. M. Flourens gives a similar account of its proceedings. Professor Lenz also describes the voracity of the Mole, and its determined mode of destroying larger animals than one would suppose it capable of managing. A Mole in his possession destroyed and devoured, in the course of twenty-four hours, a large Slowworm, a large Snail, two Chrysalids, and a Snake about thirty-two inches long. Of the reptiles he left nothing but the skin and the bones.

It is probably by the sense of smell chiefly that the Mole is guided in its search for prey. Brehm found that when he had got a Mole buried in some earth in a box, and placed a few fragments of chopped meat on the surface, in a few minutes the earth rose, the muzzle of the Mole appeared, and the meat was devoured. The sense of sight is perhaps in general of little use to the animal; but there are times in its life when to see is an advantage; and time-honoured as the belief may be, there is no doubt that the supposition that the Mole is blind is merely a popular error. It has indeed long

been known to naturalists not only that the Mole had eyes, but that these were sufficiently open to enable him to see, and at one time considerable obloquy was heaped upon the memory of Aristotle for having given origin to a statement to the contrary. It would appear, however, that Aristotle's statement was approximately correct with respect to the southern European species upon which his observations were probably made, and the error was that of those naturalists who applied the assertions of the Greek philosopher to a different animal.

Like other great gormandisers, the Mole is an exceedingly thirsty creature. "Where a colony of Moles exists," says Mr. Bell, "a run is always made towards the nearest ditch or pond;" and the same writer states, on the authority of Mr. Jackson, an intelligent Mole-catcher, that where water cannot conveniently be reached, "the animal sinks deep, perpendicular shafts, at the bottom of which water is always found, to which the Mole has easy access. Sometimes, also according to the observations of Mr. Jackson, these wells are full to the brim." These statements are confirmed by a German Mole-catcher, cited by Brehm.

We have already seen that the essential conditions of the Mole's life consist in continual burrowing. Hence, not unnaturally, the animal shows a marked preference for light soils, and through these he makes his way with remarkable ease and rapidity. Oken says of a Mole, which he kept for six months, that when put into a box of sand, it would make its way through the sand almost as quickly as a fish through the water. In its natural mode of life, however, it by no means confines itself to such vagarious proceedings, but constructs a most complex habitation, which is formed with wonderful art.



MOLE'S FORTRESS.

Each Mole has his own encampment, frequently entirely separate from those of his fellows, but sometimes the animals evince a rather more sociable disposition, and condescend to make use of a common passage. But in his encampment, each Mole always has his own dwelling, which has been, not inappropriately, styled his fortress, and this certainly displays great ingenuity and skill in its design and construction (see figure). It is formed under a hillock of earth, in a situation which affords some protection to the little domicile. Its roof is a firm dome, the earth composing it being pressed into a solid mass by the Mole while excavating the internal passages and chambers. Beneath this there are two circular galleries, one above the other, the lower one considerably larger than the upper, with which it communicates by five nearly equi-distant passages, running slantingly upwards. Within the lower circular gallery is situated the actual dwelling-place or chamber, to which access is obtained by three passages descending from the upper gallery, so that when within his house the Mole has to go both up and down stairs to reach his bedroom. But the chamber has another issue by a passage which at first descends for a short distance, and then rises again to lead into the high road running to and from the fortress, which is always single; and, on the other hand, the lower and larger gallery gives off about nine other passages, which either terminate at a short distance from the fortress, or, after making a detour, return into the high road. So cautious is the Mole, that the apertures of these passages are said seldom to be made opposite to those which lead from the lower to the upper circular gallery. With these arrangements it must be confessed that the Mole has provided admirably for being "not at home" to unwelcome visitors.

The same caution that prompts the Mole to the formation of so complicated a castle leads him to take equal care in the construction of the road leading into it. This usually runs in a direct line from one end of the animal's camping-ground to the other, and forms a highway by which he can go quickly about his business. It is large enough to enable him to pass through it easily, but in making it he is careful not to throw out the earth as he does in his ordinary runs, and the whole passage appears to be

chiefly formed by compression of the earth by the little engineer. By his constant passing to and fro, its walls become singularly smooth and compact. Occasionally a Mole will form two or more high roads leading from his fortress, probably when supplies fall short and it is necessary to open up new ground; and sometimes several Moles share the same highway, perhaps in localities where worms and grubs are peculiarly fat and abundant. But in the latter case, as there is not room in the little tunnel for one Mole to pass another, if two of them meet by accident one must give way or retire into a side alley, otherwise a violent combat ensues, when the weaker is ruthlessly killed and devoured. The road varies in its depth from the surface according to the nature of the soil and other circumstances; in safe localities it is usually at a depth of four or five inches.

It is through this well-beaten path that the Mole goes out to his hunting-grounds, and by it also that he is obliged to return. The Mole-catchers are well aware of this peculiarity in the habits of the animal, and one of their most successful devices for its capture consists in placing traps in the course of the high road at a time when the Mole is sure to be out on a foraging expedition, so as to intercept him on his way home. The rapidity of its motion along the high road, especially when alarmed, was demonstrated by an amusing experiment shown to M. Geoffroy St. Hilaire by M. Le Court. The latter, having ascertained the direction of a Mole's road, and found that the animal was hunting at its furthest extremity, placed all along the line at certain distances pieces of straw, passing one end of each into the little tunnel, and attaching little paper flags to the other. He then inserted a horn close to the extremity of the tunnel, and, blowing into it, produced a frightful noise, upon hearing which the Mole naturally made the best of his way home to his fortress, indicating his progress by throwing off the little flags as he passed the successive straws. It was estimated that the speed of the frightened animal was equal to that of a Horse at full trot.

The extreme voracity of the Mole has already been mentioned, but it may be urged in his excuse that the hard labour he has to perform renders a considerable amount of good nourishment absolutely essential to him. Mr. Bell says that his activity in search of food is principally in the morning and evening, and that he sleeps the greater part of the day. In seeking his food, the course adopted by him in making his highway would not answer: he must now dig through the ground to see what it contains, and in doing this he is of course embarrassed by the loose stuff that he dislodges. To get rid of this he makes his way to the surface from time to time, breaks through, and pushes the troublesome rubbish out with his nose, producing those well-known "Mole-hills" of loose earth which so commonly betray his progress in our fields and meadows. The depth at which the Mole works in his hunting-grounds depends very much upon circumstances. In light and newly-worked soils, after rain, when the earth-worms especially come to the surface, the Mole will travel along in a sort of shallow trench in pursuit of his prey. In winter we have the reverse of this picture, for then the Moles are compelled to go far down in pursuit of the worms, which have been driven from the surface by the frost.

It must not be supposed, however, that eating and sleeping make up the whole life-history of the Mole. Very early in the year a time comes when he feels strange emotions stirring within him, and then he goes off gallantly, in his velvet coat, in search of a partner in his lonely encampment. That he will not be allowed to bring home his bride without many an appeal to his weapons is almost a matter of necessity, for by some singular dispensation the number of male Moles is very much greater than that of the opposite sex, a disproportion which, as might be expected, gives rise to a good deal of jealousy and its natural consequences among such fierce and untamed spirits. As the male goes on his wooing he makes numerous but very shallow tracks in all directions. These have received the elegant name of *traces d'amour* from the French naturalists. The lady having been found, the next business is to secure possession of her, and this is attended with considerable difficulties, both from the impertinent intrusion of other males, and from a tendency on the part of the lady herself to run away from the proffered happiness. The intending bridegroom must have rather a hard time of it. But at length the bride's coyness and the assiduities of rivals are got rid of, and the pair settle down to inhabit for a time the same encampment, and to bring up their little family. It would appear that the affection of the male for his mate continues to be of a very warm kind, at least M. Le Court states that he several times found a female caught in a trap with the male lying dead beside her. The possession of strong family affections by the Mole would seem further to be proved by an observation communicated to M. Le Court, according to which, when

the Mole's nest is invaded by a sudden flood, both parents may be seen struggling bravely, and risking their own lives to save their young, and mutually assisting and protecting each other while thus engaged.

The period of gestation in the Mole does not appear to be very accurately known, but it is supposed to be about two months. The young are brought forth earlier or later, according to the season, but most commonly in April. There are generally four or five, but sometimes only three, and occasionally six or even seven in a litter. They are produced in a nest lined with grass, fine roots, dried leaves, and similar materials collected in a sort of chamber, which is formed by the enlargement of the point of junction of three or four of the ordinary passages, always separate from the fortress, and often at a considerable distance from it. Only a single brood is produced in the year.

We have devoted so much space to the natural history of the Mole because, whilst it is really the most interesting, from this point of view, of all our British Mammals, there is no other which is exposed to such constant and severe persecution. In all parts of the country we find professional Mole-catchers, who make it their business to ascertain the habits of the animals, and taking advantage of this knowledge, capture them in great numbers. We shall not attempt to describe the various contrivances used to effect these massacres. It will suffice to state that the principle on which most of them are worked is the insertion into the ascertained run of the Mole of a trap of some kind, which catches him as he is passing. The grounds upon which this war of extermination is waged against the Mole are chiefly the mischiefs which it causes by means of its runs and burrows in fields and pastures; but it may be questioned whether the Mole does not more than compensate for any damage thus produced by the destruction of many insects and other noxious animals.

THE BLIND MOLE.*

We have already mentioned a southern European species which may have given origin to Aristotle's statements as to the blindness of the Mole. This is an inhabitant of Italy, Dalmatia, and Greece, and is said to occur rarely in the south of France, in Switzerland, and in some other parts of Europe. It closely resembles the common species, but has the eyes covered by a membrane pierced only by a minute hole, so that the animal's sole visual consciousness must be limited to a mere perception of light. Its fur is of a deep greyish-black colour; and it differs chiefly from the common European Mole in having the middle upper incisor teeth larger than the rest. In its general habits the Blind Mole agrees with our British species, but it is said to make its runs less extensive and nearer to the surface. Its nest also is said to be made in the chamber within the fortress.

Besides these, several nearly allied species of True Moles are found in northern India, chiefly among the hills, such as the Short-tailed Mole (*Talpa micrura*), in which the tail is exceedingly short, the Long-tailed Mole (*T. macrura*), and the White-tailed Mole (*T. leucura*). The first-named species inhabits Nepaul and Darjeling, and at the latter place, according to Mr. Jerdon, it is not uncommon, and many of the roads and pathways are intersected by its runs, which often proceed from the base of one great oak-tree to that of another. If the runs are broken into they are generally repaired during the night, and no Mole-hills are thrown up like those of the European Mole. The White-tailed Mole differs from the other species in having only three premolars on each side in each jaw, making forty teeth in all. Upon this ground Mr. Gill establishes the genus *Parascaptor* for it.

Still further east, in Japan, we find the Woogura Mole (*Talpa woogura*), which resembles the European Mole in general form and habits, but has the fur of a dingy tawny colour, and the nose unusually produced. In this species there are two incisors less in the lower jaw than in *T. europœa*, and M. Pomel forms for it the genus *Mogera*.

The Abbé Armand David, during his travels in Chinese Mongolia, discovered a Mole closely resembling the European species in its general appearance and characters, which has been called the Musky Mole (*Scaptochirus moschatus*). It was found, however, to possess one premolar less on each side in each jaw than the True Moles (*Talpa*); and from certain peculiarities in the form of the teeth M. Milne-Edwards infers that the animal is less exclusively insectivorous than the Common Mole. It is remarkable for the strong musky odour which it diffuses. The Musky Mole has fur even softer than that of the European Mole, of a bright greyish-brown colour with a tawny tinge, and presenting a brilliant

* *Talpa cæca.*

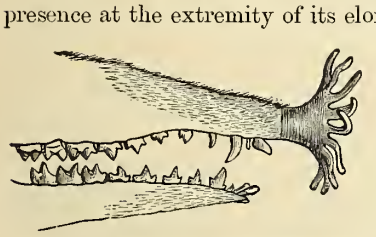
lustre. The muzzle is shorter than in the European Mole, and no trace either of ears or eyes can be detected externally. The tail is nearly naked, but almost concealed in the hairs of the body. Nothing seems to have been ascertained about the habits of this animal.

The Scaptonyx (*Scaptonyx fusicaudatus*) is another of the curious Eastern forms which so remarkably unite to each other different types of these small Mammals. In its external characters it resembles *Urotrichus*, but it has the dentition of the genus *Talpa*, and the nostrils are not elongated into a proboscis. Its length is about two inches and a half, and the length of its tail about one inch and two-fifths. The fur is thick and soft, and the hairs are blue-black at the base, with a brownish tint towards the tip. The single specimen described was obtained on the borders of Kokonoor and Setchouan, but nothing is recorded of its habits.

THE STAR-NOSED MOLE.*

Besides the Eastern forms to which we have just referred, there are a few American species of this family, which differ rather more decidedly from the ordinary Moles. Perhaps the most remarkable of them is the Star-nosed Mole, an inhabitant of Canada and the United States, extending from South Carolina to Hudson's Bay, and stretching right across the continent, from ocean to ocean.

The most striking characteristic of this animal, which constitutes the genus *Condylura*, is the presence at the extremity of its elongated nose of a sort of fringe of about twenty long fleshy processes, forming a regular star, having the nostrils towards its centre. The names *Rhinaster* and *Astromycter*, both meaning "Star-nose," have been given to the genus by different writers. The name *Condylura* is founded on a mistake, the tail having been supposed to have a knob or knot. The tail is nearly as long as the body, the general appearance of which is mole-like, but the shoulders are stouter and heavier in proportion to the hind-quarters than in our Common Mole, although the digging hands are hardly so powerful. The last phalanges of the fingers are not cleft, as in the Mole. The skull is elongated, and the jaws contain in all forty-four teeth—namely, besides canines, three incisors, four premolars, and three true molars on each side in each jaw. The arrangement of the teeth in the long jaws is rather peculiar. In the upper jaw the two middle and the two outer incisors are of large size, and the latter are quite like canines; between them is a third minute tooth on each side. The true canine is very small; the first three premolars are thin and sharp, and the fourth much larger than the rest. In the lower jaw we find four projecting incisors, and behind the outer ones on each side a much smaller one, followed at an interval by a small canine with two roots. The eyes are very minute, and there are no external ears.



SIDE VIEW OF SNOUT OF STAR-NOSED MOLE. (*Twice Natural Size.*)

FRONT VIEW OF SNOUT OF STAR-NOSED MOLE.

This curious little animal, which measures about five inches in length, and has a tail about three inches long, is of a brownish-black colour, a little paler beneath, but appearing in certain lights perfectly black throughout. The naked, or nearly naked parts, such as the nose, with its singular appendages, and the feet, are generally of a flesh-colour, the tips of the fringes and of the claws being, in fact, quite rosy. The tail is well covered with hair.

The Star-nosed Mole, like the other members of its family, lives beneath the surface of the ground, where it is able to burrow rapidly in soft earth. It prefers the vicinity of brooks or swampy places. The galleries do not run so near the surface as those of the Common Shrew Mole of America. The nest is composed of dried grass, and placed in an excavation made under some protective object, such as a stump or the root of a tree. The young show scarcely any trace of the nasal appendages. The precise use of these curious organs in the adult does not seem to be ascertained; probably they aid as sensory organs in the discovery of the worms and larvæ of insects on which the creature feeds.

THE COMMON SHREW MOLE.†

The Shrew Mole, which is often called simply the Mole in the United States, is another very widely-distributed species in North America, throughout the whole eastern part of which it is found

* *Condylura cristata.* † *Scalops aquaticus.*

abundantly. Like the other species of its genus, which inhabit the territories farther west, the Common Shrew Mole has an elongated, slender snout, which is cut off obliquely at the end, so that the nostrils, which are situated in this sloping surface, are turned forwards and upwards, and are not visible from below; a short and nearly naked tail; and only thirty-six teeth, which present the following characters:—In the upper jaw there are on each side three incisors, of which the foremost is very large and pyramidal, whilst the other two are very small; then four compressed teeth, gradually increasing in size, of which the first may be regarded as a canine and the rest as premolars; and beyond these three large, true molars, each having the crown furnished with strong cusps, and distinctly divided into two parts. The lower jaw has only four instead of six incisors, and these are nearly horizontal, and the two inner ones are much smaller than the outer; these are followed immediately by three simple, gradually increasing teeth, regarded as premolars; and these again by three large true molars. According to this interpretation there are no lower canines. The feet are like those of the Mole, but the toes of the hind feet are webbed.

Two other species of *Scalops* are found in the western parts of the United States. One of them, the Prairie Mole, or the Silvery Shrew Mole (*S. argentatus*), which is about seven inches long, and has the hairs annulated with white and lead colour, giving it a silvery appearance, inhabits the western prairies, advancing as far to the eastward as Ohio and Michigan; the other, the Texan Shrew Mole (*S. latimanus*), which is still larger, and has the fore feet broader than in any other species, and the black hair longer, thinner, and slightly crisped, is a native of Mexico and Texas.

Two other Shrew Moles have been formed into a distinct genus (*Scapanus*) by M. Pomel. They resemble the preceding in general characters, but agree with the Star-nosed Mole in having forty-four teeth. These are Brewer's Shrew Mole (*Scapanus Brewerii*), a black species, about six inches long, which inhabits the eastern United States, and is supposed to have given the foundation for the reports of the existence of the Common Mole in North America; and the Oregon Mole (*Scapanus Townsendii*), a considerably larger species, which is said to extend all along the Pacific coast, from California to 47° 10′ N. lat. In their habits these animals seem to agree closely with the Star-nosed Mole. The western species occurs abundantly in the banks of rivers.

FAMILY IX.—MYOGALIDÆ.—THE DESMANS.

Some very curious and interesting animals, placed with the Shrews by some zoologists, and with the Moles by others, may, perhaps, for our purpose, be best placed as a distinct family. The Desmans are, in fact, Shrew-like animals, with some important points of resemblance to the Moles. Thus, the teeth in the true Desmans are forty-four in number, and the large upper front incisor is pyramidal, and rather resembles that of some Moles than that of the Shrews; the general character of the skull is Mole-like, especially the presence of a slender zygomatic arch, which does not exist in the Shrews; the shoulder-blade is long, narrow, and strong, the collar-bone short and stout, and the front portion of the sternum is slightly keeled. Many other slight osteological peculiarities point to an alliance with the Moles; but on the other hand, Shrew-like characters are not wanting, and the general structure of the body and limbs is that of the Shrews, the tail being well developed, and the limbs all formed for walking. In the true Desmans the hind limbs are considerably larger than the fore-limbs, and all the feet are palmated, or have their toes united by webs.

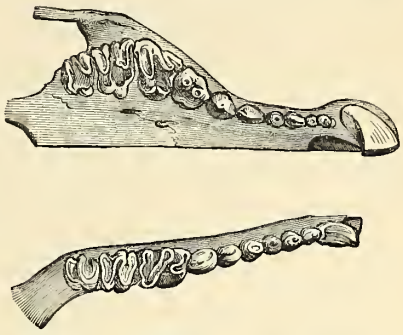
THE DESMAN.*

The Desman in general form resembles a big Rat, but with a long snout formed by the nostrils, which are produced in a tubular form, and united in the middle, producing a regular trunk, provided with muscles which enable it to be turned in various directions, and employed as an organ of touch. The tail is compressed, scaly, and nearly naked.

In the arrangement of the teeth we see a considerable resemblance to the Shrew Moles. Thus, in the upper jaw we have the same gigantic front incisors, larger here than in any other species, and these are followed on each side by a series of seven teeth, gradually increasing in size, the first of which is an incisor, the second a canine, and the remaining five premolars. In the lower jaw, there are four projecting incisors, the outer much larger than the inner ones, as in the Shrew Moles, then, on each

* *Myogale moschata.*

side we have six gradually enlarging teeth, a canine, and five premolars. The true molars are three in number on each side in both jaws. They are broad, powerful teeth, with strong acute tubercles, and crowns divided transversely into two parts. The eyes are small, and there are no visible ears.



DENTITION OF DESMAN. (*Natural Size.*)

Another peculiarity of these animals is the presence, under the root of the tail, of a large gland, which secretes a substance of a strong musky odour, whence they are sometimes called Musk Shrews. This gland is composed of from twenty to forty lobes, each having a dilated upper part, and a narrow lower portion, and containing in their walls a great number of small secreting sacs.

The Desman, or Wyehuchol of the Russians, is an inhabitant of Southern Russia, where it lives in the banks of streams and pools, in the region between the Don and the Volga. It is also said to occur in some parts of south-western Asia. Its body is about ten inches long, and its tail measures about seven inches and a half. The latter organ is narrowed at the root, and then nearly cylindrical for some distance, and finally compressed from near the middle to the extremity, thus forming a most powerful swimming organ, by means of which, aided by the broad webbed feet, the Desman makes its way through the water with great rapidity. The surface of the tail is scaly, with a scanty sprinkling of short hairs, and with a great number of small follicles, which secrete a greasy material.

The body of the Desman is covered with a dense fur, composed of a thick coat of fine downy hairs next the skin, and of longer smooth hairs, which form the outermost coat. It is reddish-brown on the back, ashy-grey on the belly, and shows a silvery lustre in certain lights. The feet are naked and scaly above, and fringed with hairs at the sides. At the eye, and over the auditory aperture, there are whitish spots.

In its habits the Desman is described as greatly resembling an Otter on a small scale. It lives by preference about standing waters and slow streams, especially when these, as is so commonly the case in Russia, are confined by steep banks of considerable height. In these banks it makes its residence, which is something like that of the Otter, consisting of a passage running obliquely upwards from below the surface of the water, often to a length of twenty feet or more, and then terminating in a sort of fortress-chamber, three or four feet above the water level. But this retreat is only occupied by the animal as a resting place; the greater part of its time, both in summer and winter, being passed in the water. Here it disports itself with an agility of which its rather heavy and clumsy figure would hardly appear to give promise; swimming and diving readily, making its way among the water-plants, and seeking constantly for the animals which constitute its food. These are chiefly leeches, worms, and aquatic mollusca and larvæ of insects, but in all probability no small aquatic animal would come greatly amiss. The curious movable trunk with which the animal is endowed is brought actively into play during the search for provisions. It is turned and twisted in various directions, touching the various objects that come in the way, and is used to feel about for prey, which it is said to seize and convey to the neighbouring mouth after the same fashion as the trunk of an elephant. The animal is said frequently to put its trunk into its mouth, and then to cry like a duck; when irritated or threatened, it hisses, and tries to bite. The Desman is supposed to produce more than one litter in the course of the year. It is pursued for the sake of its skin, which somewhat resembles that of the Beaver and Ondatra in its qualities; and great numbers are taken by means of nets, especially in the autumn. Its flesh is uneatable, on account of its strong musky flavour, which is communicated even to that of the carnivorous fishes, such as the Pike, which, being less nice in their tastes, do not object to an occasional Desman.

THE PYRENEAN DESMAN.*

The only other species of Desman is found in the small streams of the Pyrenees both in France and Spain, where it lives after the same fashion as its Russian relative, but is said to feed principally upon

* *Myogale pyrenaica.*

trout. It is much smaller than the preceding species, being only ten or eleven inches in total length, nearly one-half of which is occupied by the long tail. The fur is chestnut-brown on the back, greyish-brown on the sides, and silvery grey on the belly; the upper lip bears some pectinated whiskers, the sides of the trunk are covered with white and the fore-feet with brownish hairs; while the hind-feet are naked and scaly. This animal also diffuses a strong musky odour.

THE HAIRY-TAILED MOLE-SHREW.*

Besides the true Desmans this group is considered to include two or three singular little creatures which lead directly towards the true Moles. One of these is a Japanese species, discovered by Professor Siebold, and described by Professor Temminck under the name of *Urotrichus talpoides*, which we may call the Hairy-tailed Mole-Shrew. It differs from the Desmans, and agrees with the true Shrews in having only two incisor teeth in the lower jaw. There are thirty-eight teeth in all. It is about the size of the common Water Shrew, with the nose greatly elongated, not into a flexible proboscis, but into a snout with the nostrils placed at the sides of the tip; the tail is about an inch long, stout, scaly, and covered with long hairs, which form a tuft; the fur is brown and velvety, and the snout and feet flesh-coloured, and nearly naked.

This animal is common at elevations of from 1,000 to 1,200 feet in the mountains of the southern and eastern parts of Japan, but becomes more rare towards the north. In its habits it resembles the Moles, digging out galleries in the earth, but going down deeper, and rarely if ever forming heaps of loose earth at the surface.

A nearly allied species, Gibbs' Mole Shrew (*Urotrichus Gibbsii*), is found in North America.

Another species, leading more towards the Shrews, was discovered in eastern Thibet by the Abbé David, and described by M. A. Milne-Edwards under the name of *Uropsilus soricipes*, or the Shrew-footed Uropsile. The general characters of the animal are very like those of *Urotrichus*, but it has one premolar less on each side in each jaw, making the total number of teeth only thirty-four. The tail is naked and scaly; and the fur is of a slate-colour, with a slight brownish tinge.

FAMILY X.—SORICIDÆ, OR THE SHREWS.

A great number of small mouse-like and rat-like animals, presenting shades of character which render their classification almost insuperably difficult, constitute the family of the Shrews, which, as we have already stated, may be regarded as representing the generalised or central idea of the Insectivorous Mammal. On all sides the other families include anomalous species, and the characters which distinguish these from their immediate fellows generally tend in the direction of the Shrews.

In these creatures we find a mouse-like body, terminated in front by a small head, with a long pointed muzzle, and behind by a nearly naked, scaly tail of variable length. The eyes are small, as also are generally the ears; the limbs are short, and nearly equal in size; the skull is long and narrow, and has on each side of its base a space not filled up with bone; the teeth are from twenty-eight to thirty-two in number, and the middle incisors in both jaws are very large; the skull has no zygomatic arch or tympanic bony bubble; the bones of the shank (tibia and fibula) are united; and the intestine has no cæcum. On the sides of the body or at the root of the tail the Shrews possess peculiar glands, which secrete a fluid of strong odour, serving no doubt to protect them from many enemies.

The Shrews are distributed over all parts of the Old World and in North America. They live generally on the ground, although some take freely to the water, and they feed upon worms, insects, and other small animals such as they can overcome. The difficulty of classifying these animals to which we have already alluded has led to their being divided into an infinity of generic groups, of which we shall endeavour to illustrate those which are now most generally accepted.

THE COMMON SHREW.†

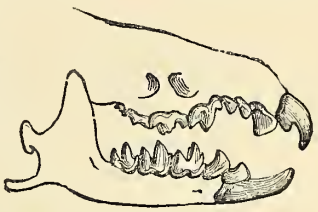
The Common Shrew, or Shrew-mouse, as it is often called, may be noticed first, as being the species most likely to be met with by our readers, in this country at any rate. It is one of the species for which the Linnean generic name *Sorex* has been retained, the group as restricted including Shrews

* *Urotrichus talpoides.* † *Sorex vulgaris.*

12 1. PIGMY SHREW. 2. COMMON SHREW. 3 AND 4. WATER SHREW.

with from thirty to thirty-two teeth, there being four or five premolars in the upper and only two in the lower jaw; with a basal tubercle to the upper inner incisors; with ears of moderate size directed backwards, a long tail, and the feet not fringed with hairs.

Our Common Shrew is a pretty little mouse-like creature (see figure in the full-page illustration), measuring about two inches and three-quarters in length, with a tail rather more than an inch and a half long. Its fur is generally of a reddish-grey colour above, and greyish beneath; but the colour varies considerably, being sometimes blackish or chestnut above, and tinged with yellow beneath. The fore teeth are of a rich brown colour. The tail is four-sided,* with the angles rounded off, and is nearly of equal thickness throughout; it is covered with short, close, stiffish hairs. Mr. Bell states that the Shrew sometimes occurs spotted with white, and that he possesses one specimen "which is beautifully pied, having a broad white band over the loins, which extends all round the animal."



DENTITION OF COMMON SHREW.

The food of the Common Shrew consists chiefly of insects and worms, but it also eats the smaller mollusca, and even the common Slug (*Limax agrestis*), according to Mr. Bell, who says that he has not only found the remains of that animal in its stomach, but has also fed it upon slugs in confinement. Like its ally, the Mole, it is very pugnacious, and two Shrews rarely come together without a battle, when the weaker one is killed and eaten. The breeding season of the Shrew is in the spring, when the female makes a comfortable nest of soft dry herbage in some convenient hole in the ground, and there brings forth from five to seven young ones. Their increase is checked to a certain extent by natural enemies. Thus, the Mole is said to kill and eat them when they come in his way; and Cats, Weasels, Owls, and some other animals, will also kill them; and some at least do not disdain to make a meal upon them. The Barn Owl especially seems to make great havoc among the Shrews.

All sorts of evil qualities were attributed to the Shrew by our ancestors, some of which are still believed in. One old writer says that the Shrew-mouse is "a kind of Field-mouse of the bigness of a Rat and colour of a Weasel, very mischievous to cattel; which, going over a beast's back, will make it lame in the chine; and the bite of it causes the beast to swell at the heart and die." The running of a Shrew over the leg of a beast was generally believed to cause the latter great pain, and to produce lameness. The proper cure for these imaginary ills was on a par with the mischief; the remedy was the application to the part affected of a branch or twig of a shrew-ash, which, says Gilbert White, "was made thus: into the body of the tree a deep hole was bored with an auger, and a poor devoted Shrew-mouse was thrust in alive, and plugged in, no doubt with several quaint incantations since forgotten."

There is one circumstance in the natural history of the Shrew that must have struck everybody, although it is still entirely unexplained. This is the death of great numbers of these animals in autumn without any apparent cause. Residents in the country will know that at that season Shrews may be seen lying dead on almost every footpath; in fact, the observation is so general as to have given rise to another superstition, namely, that a Shrew cannot cross a public path without paying the penalty of death. The individuals thus found dead are of both sexes, and of various ages.

The Common Shrew occurs not only in the British Islands, but also over the whole continent of Europe, from Sweden and Russia to the shores of the Mediterranean.

The Lesser Shrew (*Sorex pygmæus*, see figure in the full-page illustration) is a second British species nearly allied to the preceding, but smaller, measuring rather less than two inches in length, and with a proportionately longer tail. The lower parts of the body are also whiter. It is the smallest of British Mammals.†

DEKAY'S SHREW.‡

Some small species of American Shrews agree with the restricted genus *Sorex* in the number of

* Hence the species was called *S. tetragonurus*, by Hermann.

† Two or three other Old World species belong to this group, among which may be mentioned the Alpine Shrew (*S. alpinus*), which appears to range from the Alps to India; and the Blackish Shrew (*S. nigrescens*), a very common species in Sikkim and Nepaul. At Darjeling Mr. Jerdon found many specimens lying dead in the roads without apparent injury. Several allied species also inhabit North America, such as Forster's Shrew (*S. Forsterii*), the Long-nosed Shrew (*S. longirostris*), &c.

‡ *Blarina Dekayi.*

teeth, but have no lobe at the base of the upper incisors; the external ear is small, turned forward, and the tail short, usually not longer than the head. These form the genus *Blarina*.

Dekay's Shrew is about four inches and a half long, and the tail about an inch. Its fur is of a rusty yellow-grey colour above, paler beneath; the nose and feet are reddish-brown, and the front incisors black. From Dr. Bachman's description it would appear that this animal burrows rather deeply in the ground, after the fashion of the Mole. It is found in the northern United States.

THE GARDEN SHREW.*

A very considerable number of Shrews, distributed in all parts of the Old World, and including two or three well-known European species, have been formed into the genus *Crocidura*, which in its turn has been divided again and again by means of characters generally of very slight importance.

The *Crociduræ* have from twenty-eight to thirty teeth, all white, or with white tips; the lower incisors are not toothed; the teeth between the incisors and the molars in the upper jaw gradually decrease in size; and the tail is covered with short hairs, among which there are a good many longer ones.

The Garden Shrew (*Crocidura aranea*) is a small species, usually measuring a little over four inches in total length, of which the tail occupies about an inch and a third. It has twenty-eight teeth which are all white. The fur is of a mouse-grey colour, shading off into whitish ash on the lower surface; the feet are light ashy, with the toes flesh-coloured, as is also the tip of the snout; and the ears, which are well exposed, are ash-coloured above and whitish below. The fur occasionally has a reddish-brown tinge; and, as in the Common Shrew, specimens spotted with white, and even albinos, sometimes occur. This is a common species almost all over Europe, but does not occur in Sweden or in the British Islands. It lives in woods and plantations, in the fields and in gardens, and in the winter approaches close to the houses, sheltering itself under stones and other objects, and sometimes even entering stables and other outbuildings. Like the other species, it feeds upon insects, worms, and other small animals, and like them also it has the reputation of injuring domestic animals by walking over them.

The Tuscan Shrew (*Crocidura etrusca*) is another well-known European species, but its distribution is much more limited than that of the Garden Shrew. It is found generally in the extreme south of Europe, from France to the Black Sea, and also in the north of Africa, but does not appear to extend north of the Alps. Like the Garden Shrew, it frequents gardens, and not unfrequently comes into houses and outbuildings. In the open country it selects dry and warm situations.

The total length of the Tuscan Shrew is from two inches and a half to two inches and three-quarters, and as the tail is nearly an inch long, the head and body may measure little more than an inch and a half. It is the smallest of living Mammals. The teeth are thirty in number. The colour of the fur is ashy with a reddish tinge above, light ashy beneath; the tail is clothed with short hairs, and with a series of rings of longer white hairs; and the ears are of moderate size, projecting distinctly from the fur. In its habits it agrees with the other species.

THE RAT-TAILED SHREW.†

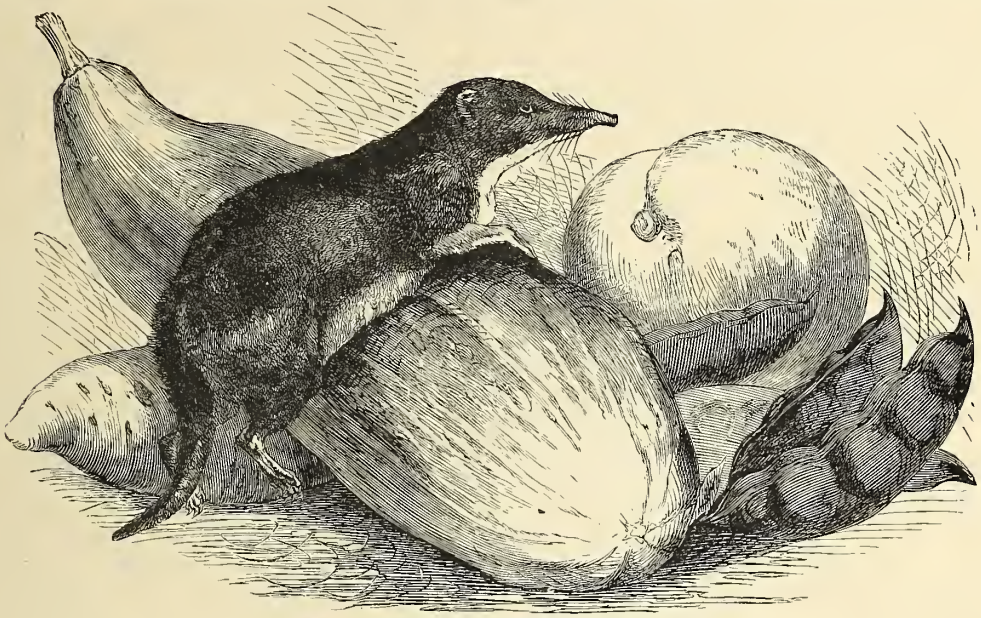
Amongst a number of Indian species, some of which are of doubtful distinctness, we may notice one which seems to be widely distributed in the East, and well known in India and elsewhere, under the name of the Musk Shrew, or Musk Rat. It is usually of a dark brown or even blackish colour above, and much paler beneath, but it varies considerably in this respect, and thus has probably given origin to several so-called species. The ears are of considerable size, and the tail, which is about three-fourths the length of the body, is thickened towards the root—a character of the sub-genus *Pachyura*. The animal is about six inches long. It is a very common Indian species, and frequents houses at night, hunting round the rooms in search of the Cockroaches and other insects which abound there. From time to time it utters a sharp, shrill cry. Its musky odour is exceedingly strong, and is said to impregnate everything that the animal passes over; in fact, the popular belief in India is that in running over a bottle of wine or beer, it is capable of infecting the contents! This, however, is rather more than doubtful. Mr. Jerdon distinguishes two species—an Indian one which he calls *Sorex cærulescens*, and which is usually of a bluish ash colour, and a somewhat smaller species, chiefly inhabiting Further India and China, to which he gives the Linnean name of *Sorex murinus*. If they are distinct, it

* *Crocidura aranea.* † *Crocidura myosura.*

is probably to the latter that Mr. Swinhoe refers in his notes on Chinese Mammals under the name of the "Musk Rat." He says that it is found throughout China, Formosa, and Hainan, in houses in large towns, being carried about in junks with the cargo. It has an unpleasant musky odour, and makes a peculiar chattering noise, which sounds like the chinking of money, and, he adds, often disturbed him in his room at night. Such a sound heard in the dark in a strange place would certainly be rather alarming to any one who had money to lose.

The "Musk Rat" of Ceylon is a reddish species, described by Kelaart as *Sorex kandianus*, and by Mr. Jerdon as *S. serpentarius*. It is rather smaller than the preceding, but takes its place in the houses of Ceylon and Southern India, and renders itself equally offensive by its strong musky odour.

Several other Indian species are referred to *Crocidura*, one of which, *C. Perroteti*, is said to be



RAT-TAILED SHREW. (*Half Natural Size.*)

even smaller than the Tuscan Shrew. Others occur in Africa, in Egypt, Mozambique, and Madagascar, and in the neighbourhood of the Cape.

THE WATER SHREW.*

Our British Water Shrew is the type of a distinct genus, all the species of which appear to haunt the margins of water. They have thirty teeth, all of which are tipped with brown or red. The upper front teeth are large and curved, and have a basal cusp behind; the lower ones are nearly horizontal, and have a single tubercle and no notch at the tip. Behind these teeth there are on each side in the upper jaw four small teeth, the last of which is very minute; and in the lower jaw two small teeth. The molars are four on each side in the upper, and three in the lower jaw. The snout is pointed, and furnished with very long whiskers; the eyes small; the ears of moderate size, and valvular; and the feet and lower surface of the tail fringed with stiff hairs.

Our Water Shrew (see figure in the full-page illustration), which measures about three inches and one-third in length, and has a tail rather more than two inches long, is generally nearly black on the upper surface and white beneath, the colours being usually separated by a distinct line of demarcation. The hairs fringing the feet and the lower surface of the tail are white. There is, however, considerable variation in the colour of different specimens, some of which have been described as distinct species. One especially, in which the whole of the fur is of a black colour, has been called the Oared Shrew (*Sorex ciliatus* or *remifer*), but the existence of intermediate steps has led to the recognition of the identity of even this with the Common Water Shrew. Mr. Bell is of opinion that the differences of

* *Crossopus fodiens.*

coloration depend on the season and the age of the specimen. The tail is slender, four-sided, and compressed towards the tip. The Water Shrew is distributed over the whole continent of Europe, as far north as the shores of the Baltic. It is found in many localities in England and in Scotland, but is not known to occur in Ireland.

The Water Shrew is one of the prettiest of our British Mammals. Its movements, especially in the water, are very agile; and although, from its swimming by alternate strokes of its hind feet, its course is of a somewhat wriggling character, the peculiar mode in which it flattens its body so as to show a narrow white border on each side, and the silvery lustre of the coat of air-bubbles which adheres to its back, give it a very elegant appearance when thus engaged. It is found chiefly about the rivulets of mountainous and hilly countries, generally showing a preference for those quieter parts where the water flows smoothly over a sandy bottom, but it will also make its way through more broken water, in shallow parts full of stones. Clear water seems to be the great desideratum, and if this can be secured the Water Shrew will put up with a lake or pond. It is not, however, absolutely confined to the water-side, but will at times wander about the fields, sheltering itself under haycocks, and other heaps of dried plants, and even making its way into houses, barns, and outbuildings.

Nevertheless, as may be judged from the fringed tail and feet, it is essentially an aquatic animal, and its regular habitation seems to be always constructed in the immediate vicinity of water. Here the Water Shrew burrows into the soft ground of the bank, and forms a subterranean dwelling, usually with several openings, one of which is situated beneath the surface of the water, to give the little creature an opportunity of slipping quietly and unperceived into or out of its house. Its food is principally obtained in the water, and consists of aquatic insects, worms, mollusca, and crustacea, which it snaps up in its rapid flittings to and fro. In Bell's "British Quadrupeds" the pursuit of the Freshwater Shrimp (*Gammarus pulex*) in a shallow but rapid streamlet by the Water Shrew is described. The little animal was seen busily pushing about among the stones at the bottom of the water, sometimes poking its nose under them, sometimes turning them over in a fashion which might be thought beyond its strength. The result was the same in either case; the Shrew captured some small article of food, with which it made off to the side of the stream, where it was heard crunching the crustaceans between its teeth.

Besides this small prey, the Water Shrew is said by Continental writers to attack almost any small animal that comes in its way—frogs, fishes, and even small birds and quadrupeds are described as among its victims. It is also said to feed on the spawn of fishes, and, according to Brehm's testimony, will even destroy large fish, such as Carp, by eating out their eyes and brains. Carrion and dead animals will also furnish it with a meal. One of Mr. Bell's editors gives a striking instance of this. A steel rat-trap had been set, and in the morning contained a large Rat, "on which was perched a small black object, which proved on closer approach to be a Water Shrew. The Rat was dead, and the Shrew was devouring it. Although the slender snout and projecting and comparatively weak teeth of the Shrew were but ill adapted, one would have thought, for devouring prey of the size of a full-grown Rat, yet the animal had succeeded in making a small hole through the skin, and this it was most energetically employed, by means of both teeth and claws, in enlarging. So ferocious were its actions, that it might very properly be said to be *fighting* the Rat; and so intent was it on its work as to suffer itself to be captured by the observer, who laid the loading-rod of his gun across its back."

The breeding season commences in April or May, when the courtship of the little creatures commences by a persevering pursuit of his intended partner by the male. The lady exhibits a becoming coyness, leading her suitor a long chase through the water; but while thus engaged both parties keep the main chance in view, and seize everything eatable that comes in their way. The young are brought forth in a chamber in the bank, and are from five to seven or eight in number.

A nearly allied, but larger species, the Himalayan Water Shrew (*Crossopus himalaicus*), occurs in the streams of the Himalayas. Mr. Jerdon, who obtained it from the Little Rungeet River at Darjeling, describes it as five or six inches long, dark brown or blackish above, paler beneath, and with a bunch of hairs at the tip of the tail. It was said to kill small fish, tadpoles, aquatic insects, &c. Another species (*C. platycephalus*) inhabits Japan.

The Marsh Shrew (*Sorex palustris*), of North America, has been referred to this genus by some authors; but it has a long slender, cylindrical tail, with a pencil of hairs at the tip, and Professor

Baird refers it to the genus *Sorex*. The teeth are the same in number as in *Crossopus*, and likewise have their tips reddish-brown. This species inhabits the northern parts of North America up to the Hudson's Bay Territory

THE TIBETAN WATER SHREW.*

This is another of the Mammals for the knowledge of which we are indebted to the Abbé David, and it is one of the most curious species of this family, presenting a combination of characters peculiar to itself with those of the True Shrews and the Desmans. "Its head and skull," says M. A. Milne-Edwards, "refer this animal to the *Soricidæ*, whilst its palmated feet and compressed tail indicate close affinities with the *Myogalidæ;* but the sucking discs with which the lower surfaces of its feet are furnished belong to itself alone, and nothing of the same kind is to be found in the allied groups."

In some respects the Tibetan species is allied to the European Water Shrew, but it has only twenty-eight instead of thirty teeth, namely, incisors, $\frac{3-3}{1-1}$, canines, $\frac{1-1}{1-1}$, molars, $\frac{4-4}{4-4}$; the skull is flattened; the body robust, and supported on short limbs; the muzzle short, broad, and conical, with large whiskers at the sides, and the nostrils opening laterally near the extremity; the eyes exceedingly small; and the ears entirely concealed by the hair and quite destitute of a conch. The tail is stout, longer than the body, quadrangular at the base, then triangular, and finally flattened at the sides; and the feet are large and broadly palmated, so as to form vigorous swimming organs, very closely resembling those of the Desmans. As in the latter animals, the feet are fringed with stiff hairs of peculiar construction; but the nails, which in the Desmans are strong, are here small and weak. The sucking discs, already mentioned as peculiar to this animal, are certainly among its most remarkable characteristics. They occur upon the feet of both pairs, and consist of large pads, depressed in the middle to form cups, which are doubtless of service to the animal in its aquatic mode of life.

The Tibetan Water Shrew is rather a large species, measuring, when adult, nearly eight inches in total length, more than half of which, however, is occupied by the tail. It is thus much larger than our British Water Shrew. Its body is covered with hair of two kinds. Close to the skin is a very thick soft down of a slaty grey colour, through which pass numerous longer hairs, which are grey at the base and white at the extremity, causing the animal to vary considerably in appearance, according as these longer hairs are raised or laid flat. The lower parts of the body are white.

In its compressed tail and largely webbed feet this Shrew possesses most admirable instruments for progression in the water; in fact, it must be regarded as the most thoroughly aquatic of all the family of the Shrews. According to its discoverer, it lives habitually on the banks of the impetuous torrents which descend from the mountains of Moupin in Tibet; and notwithstanding the rapidity of these streams, it swims and dives in them with the greatest facility, chasing the small fishes which constitute its principal food. Although not uncommon in its native region, its activity in the water renders its capture exceedingly difficult. In order to procure specimens, it is necessary to divert the course of a stream, and then pursue the animals into the holes in which they take refuge.

THE TAILLESS SHREW.†

Another curious little Mammal, brought from Tibet by the Abbé David, is described by M. A. Milne-Edwards as forming a distinct genus, under the name of *Anurosorex*, or the Tailless Shrew. It has only twenty-six teeth in all, namely, incisors, $\frac{2-2}{1-1}$, canines, $\frac{1-1}{1-1}$, and molars, $\frac{4-4}{4-4}$. The tail is remarkably short, scarcely passing beyond the hairs of the body, slender, slightly flattened, of the same thickness throughout, and covered with small scales, from between which project a few very short hairs. The general form of the body is mole-like, the head is large, the muzzle conical, flesh-coloured, having the nostrils on each side near its extremity, and furnished with long whiskers. The eyes are scarcely perceptible, and the ears are entirely concealed beneath the hairs. The feet are short and scaly, whence the name given to the species, and the fore-feet are broader and stronger than the hind-feet, thus furnishing an additional indication of affinity to the Moles.

This species was found abundantly both in the plains and mountains of Setchouan and Tibet,

* *Nectogale elegans.* † *Anurosorex squamipes.*

where it lives in burrows which it digs in the earth. Its total length is little more than four inches, and its fur, which is very silky and thick, is of a grey colour with a greenish brown tinge. The feet are whitish and the nails white.

In the preceding sketch of the Insectivorous order of Mammals, we have followed in general the classification proposed by Professor Mivart, and slightly modified by Mr. Gill. The following summary of the arrangement will be useful for reference :—

Sub-order I.—DERMOPTERA.

Family 1. Galeopithecidæ.
Genus—Galeopithecus.

Sub-order II.—INSECTIVORA VERA.

Family 2. Tupaiidæ.
Genera—Tupaia, Ptilocercus, Hylomys.

Family 3. Macroscelididæ.
Genera—Macroscelides, Petrodromus, Rhychocyon.

Family 4. Erinaceidæ.
Genera—Erinaceus, Gymnura.

Family 5. Centetidæ.
Genera—Centetes, Hemicentetes, Ericulus, Echinops, Oryzorictes, Solenodon.

Family 6. Potamogalidæ.
Genus—Potamogale.

Family 7. Chrysochloridæ.
Genera—Chrysochloris, Chalcochloris.

Family 8. Talpidæ.
Genera—Talpa, Parascaptor, Mogera, Scaptochirus, Scaptonyx, Condylura, Scalops, Scapanus.

Family 9. Myogalidæ.
Genera—Myogale, Urotrichus, Uropsilus.

Family 10. Soricidæ.
Genera—Sorex, Blarina, Crocidura, Crossopus, Nectogale, Anurosorex.

Only in one respect have we thought it desirable to depart from Professor Mivart's system, namely, in raising the Desmans (*Myogalidæ*) to the rank of a distinct family. This course was adopted for the sake of simplicity in the classification, as the combination of characters presented by those animals places them so remarkably between the Moles and the Shrews, that from a zoological point of view they cannot satisfactorily be referred to either.

One thing that will strike the reader at once is the great number of family types, for the most part strongly characterised, that can be distinguished in so small an order. Mr. Wallace estimates the total number of species of Insectivora at 135, and of these about 65, or nearly one-half, belong to the single family of the Shrews, leaving about 70 species for all the other families; and of these 34 species, or again nearly one-half, are referred to the two widely distributed groups the Hedgehogs and the Moles.

Considering these facts, and the clear differentiation of most of the forms, notwithstanding the existence of those types already alluded to, which in several of the families seem to lead towards the *Soricidæ*, we can hardly avoid agreeing with Mr. Wallace in regarding the existing Insectivora as "the detached fragments of a much more extensive group of animals, now almost extinct," a view which is strongly corroborated by the geographical distribution of the animals.

Curiously enough several of the smaller and more peculiar families are limited much in the same way as the Pteropine Bats and Lemurs, chiefly to the countries surrounding the great Indian ocean, beneath which, as we have already stated, the hypothetical continent of Lemuria is very probably submerged. The Galeopithecidæ and Tupaiidæ are almost confined to the Malayan region, and the Centetidæ (with the exception of the anomalous genus *Solenodon*) are peculiar to Madagascar; the Macroscelididæ have their home on the eastern coast of Africa, except a single species which occurs in the northern part of that continent; the Chrysochloridæ are exclusively South African; and the curious *Potamogale* inhabits some of the West African rivers. Thus, except in the case of *Solenodon*, the whole of these groups are now represented solely within the region inhabited by the Pteropine Bats. Does this point to a "Lemurian" origin, or at any rate to a great former development in the Lemurian land, of the Insectivorous Mammalia?

Of the more widely distributed families, the Erinaceidæ occur chiefly in the northern temperate regions of the Eastern hemisphere, stretching away continuously from Europe and the North African

deserts, through Asia Minor and Persia, and across Central Asia to the Pacific Coast, whilst one or two species occur in South Africa, and one very aberrant form, the Bulau (*Gymnura*), is found in the Malayan region, along with the Bangsrings, to which it is allied through the genus *Hylomys*. The true Moles and the Shrews occur in the northern parts of both hemispheres, and the latter family, indeed, is represented in all parts of the world except South America and the Australian region. The Desmans, which stand in so peculiar a position between the Shrews and the Moles, present a curious instance of what has been called "discontinuous distribution," the two nearly allied species being found only in two localities, separated from each other by the whole breadth of the European continent. The entire absence of Insectivora from the South American continent, and the presence of the Solenodons, which seem to be most nearly related to the Centetidæ of Madagascar, in Cuba and St. Domingo, are further remarkable facts in the geographical distribution of these animals. Scarcely less singular is the distribution of the two species of *Urotrichus*, one of which occurs in Japan, and the other on the Pacific coast of North America.

The evidence derived from the fossil remains of Insectivora, as to the former history of the order, in its bearing upon the present geographical distribution of its members, is very inconclusive; but the principal facts to be gathered from it is that from Miocene times to the present day the representatives of the order in different localities, so far as these are known, have generally belonged to the same types, and no undoubted remains of Insectivora are known from earlier formations than the Miocene. At one time, indeed, some of the beautiful Mammalian fossils of the Stonesfield slate (Lower Oolite) of Oxfordshire were regarded as probably representing Insectivora, but their Marsupial character is now generally recognised; and this is the case also with the *Dromotherium* from the Trias of North Carolina, which was at one time believed to carry the present order so far back in time.

Species of the existing genera *Erinaceus*, *Sorex*, *Myogale*, and *Talpa*, and of several nearly-allied extinct genera, have been determined from Miocene and subsequent deposits in various parts of Europe, and especially from the lacustrine beds of the Auvergne; and in North America also a few species have been found and referred to genera for the most part almost identical with those still living on that continent. In some instances even the Miocene species appear to be nearly identical with those now inhabiting the same regions.

The principal apparent exceptions to this rule are to be found in a fossil species from the Miocene of the Auvergne, described by M. Pomel under the name of *Echinogale Laurillardi* (Centetidæ), and two forms described by Hermann von Meyer, as forming a new genus (*Oxygomphius*), allied to the Bangsrings, from the Tertiary basin of Weisenau, in Southern Germany. But the true position of these fossils is, to say the least of it, exceedingly doubtful; and this is still more strikingly the case with the Eocene American genus *Omomys*, supposed to be an animal allied to the Hedgehogs and the Bangsrings, but which Professor Leidy himself, in describing it, compares with nearly all the types of true Insectivora and with the Opossums.

This last comparison leads us, perhaps, towards the origin of the Insectivora. In the East, the Bangsrings, and notably the beautiful little Ptilocerque, and the curious genus *Hylomys*, which, again, seems to unite the Bangsrings with the Hedgehogs through the anomalous genus *Gymnura*, present manifest relationships with the Phalangers, some of which abound in the islands further to the east. From these animals to the true Shrews, many of which abound in the east, is no great step. On the other hand, we have already seen that Brandt recognised Opossum-like characters in his *Solenodon*, but it must be confessed that these are almost exclusively external. Professor Leidy describes, besides *Omomys* above referred to, some other fossils from the Eocene of Wyoming, which he seems to regard as Insectivorous in habit, but Marsupial in structure; and the Stonesfield Mammals, although plainly Marsupial, have Insectivorous tendencies, so that the derivation of the type Insectivora from the Marsupials, or at all events the near affinity of the two orders, perhaps at several points of contact, may be looked upon as established.

In the other direction the affinities of the order would seem to be through the Shrews, Hedgehogs, and Centetidæ with the Carnivora, towards which also the curious West African *Potamogale* seems clearly to point. The Bangsrings, again, show some traces of an affinity to the Lemurs; and *Galeopithecus* seems almost to constitute a central point of alliances, uniting the Insectivora with the Lemurs and Bats, and further exhibiting, as Mr. Wallace thinks, certain peculiarities which smack

strongly of direct Marsupial relations. The relationship of the Insectivora to the Rodentia can hardly be regarded as a true affinity, although the analogies between different types in the two orders are among the most striking phenomena of the kind with which we are acquainted. The type of the Mice and Rats is reproduced by the Shrews, the Squirrels by the Bangsrings, the Porcupines by the Hedgehogs and Tanrecs, the Jerboas by the Jumping Shrews, and the Ondatra by the Desmans; whilst even the highly specialised Moles are reflected among the Rodents by the various species of Mole-Rats. But none of these resemblances indicate affinity, and the Rodent type may be regarded as differentiated from the old probably Marsupial ancestral forms quite independently of the Insectivora.

W. S. Dallas.

Cassell Petter & Galpin, Belle Sauvage Works, London, E.C.